MARCH, 1941

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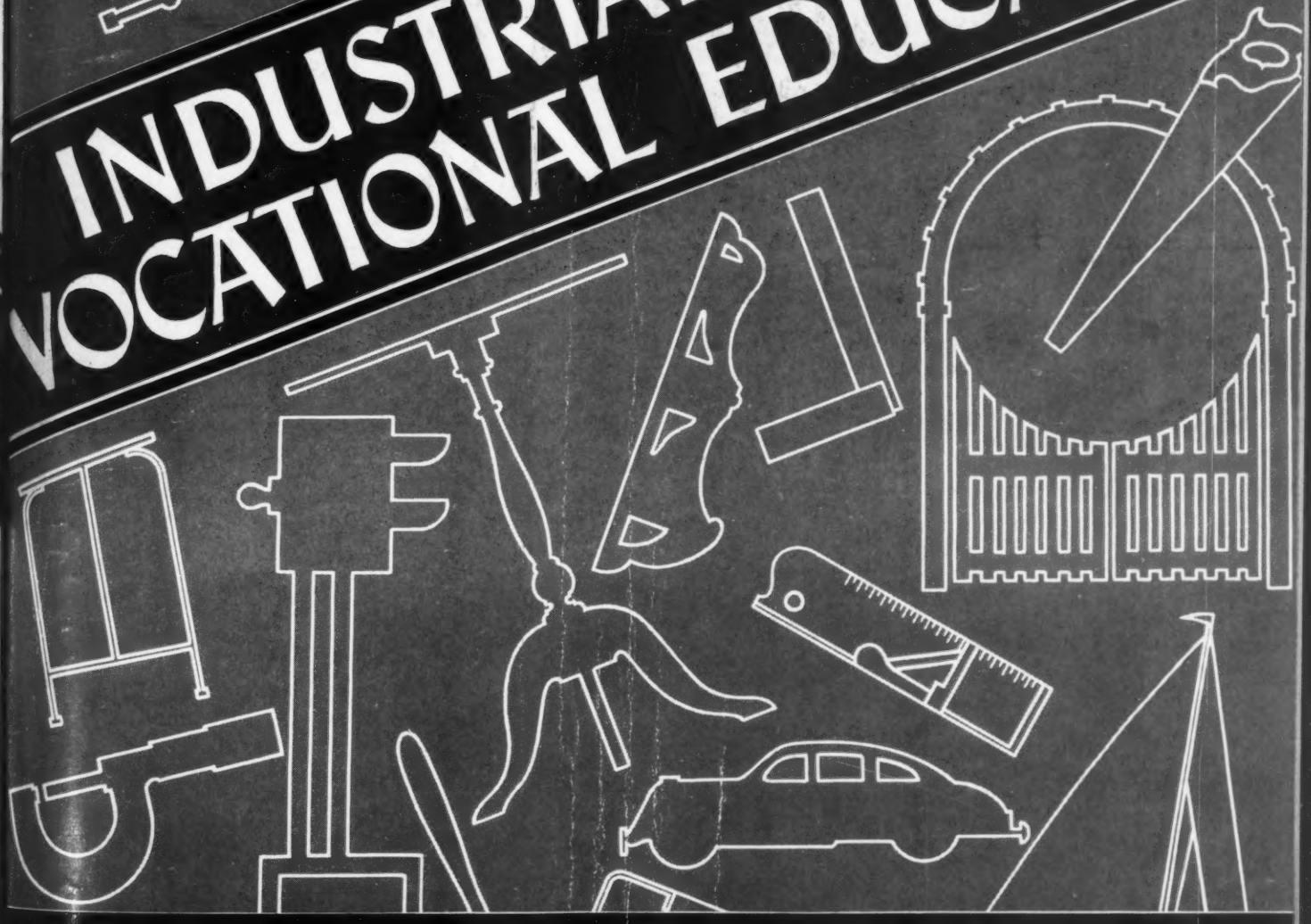
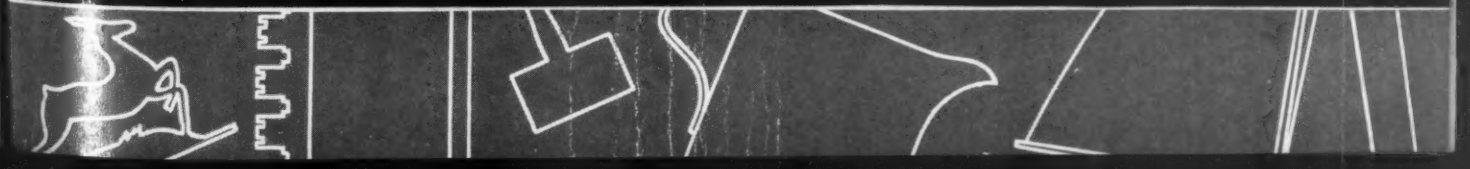


SCHOOL SHOP ANNUAL



Tyrannosaurus lived some scores of millions of years ago. The most terrible of the dinosaurs of the Mesozoic era, he was the scourge and dread of other prehistoric monsters even much larger than he. But at the end of that era, Tyrannosaurus, and Brontosaurus, and Diplodocus all perished suddenly and completely, as if erased from the earth. These monsters could not adjust themselves to life's always changing conditions.

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INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

VOL. 30 MARCH, 1941 No. 3

THE SCHOOL SHOP ANNUAL

The fourteenth edition of the School Shop Annual, which is herewith presented as the March issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, contains a special collection of articles of interest to those who are confronted with the task of planning or equipping a school shop, or of arranging or rearranging the equipment of an existing shop.

For this reason, nine of the articles included show plans of various types of shop layouts. Among these are layouts for shops in high schools, vocational schools, trade schools, teacher-training institutions, and rural high schools.

Defense training also has been given a goodly share of the available space in the annual. The work as it is taken care of in a large vocational school is described, also how the work can be made to fit into an industrial-arts program, and how a specific state is attempting to take care of this type of training. Besides these there is an article on the objectives of national defense training, and how the curriculum is to be revised to take care of defense-training requirements.

Among the course outlines there is one on the radio-serviceman's trade; another on care and repair of tractors, trucks, automobiles, and gas and Diesel engines; and a third on electric welding.

There are also a number of articles which were grouped under the heading "Miscellaneous" for want of a better title. Among these there is an outstanding article on applying graphic aids in making an occupational analysis a continuous process. Another describes a county program for industrial arts. Still another describes the NYA program. Then there is one describing how social consciousness can be developed by making the industrial-arts department undertake a cooperative venture.

The equipment and supply lists, together with the many helpful advertisements and the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION products' checking list which the School Shop Service Bureau makes available to the reader, rounds out this very complete and invaluable issue.

CONTENTS

School Shops

Laboratory of Arts and Industries, William H. Johnson 83
The Trades and Industries Building at La Crosse, John B. Coleman and W. F. Oppermann 85
Industrial Education Building, Springfield, Mo., Harry P. Study 91
An Arts and Industries Laboratory, H. D. Thomas 94
General Shop in a Southern High School, Cecil E. King and Clay A. Easterly 96
Industrial Arts at Portage High School, R. M. Naset 98
Printing High School at Cincinnati, Ohio, R. Randolph Karch 99
An Industrial-Arts Experiment Shop, Ray Karnes 101
A Rural High School Shop and Classroom, Louis M. Roehl 103

Defense Training

Training for National Defense, Robert W. Tarbell 105
Things to Think About, R. W. Selvidge 106
Industrial Arts in the Defense Program, Fred C. Finsterbach 107
Training for National Defense in Florida, Maude G. Woods 108
National Defense Training Objectives, Earl M. Bowler 111

Course Outlines

Analysis of Radio-Serviceman's Trade, Harold R. Goppert 112
Outline for Course on Care and Repair of Tractors, Trucks, Automobiles, and Gas and Diesel Engines, Elwyn R. Dell 116
Photography in the High School, R. H. Behrens 117
Electric Welding Course for High School Students, Lee Arnold 120
Curriculum Revision for Defense, Don R. McMahill 121

Miscellaneous

Graphic Aids in Continuous Occupational Analysis, Clyde A. Bowman 122
A County Arts and Industries Program, Delmar W. Olson 126
Concentrated Industrial Education Prepares Youth, Edward W. Stluka 131
Developing Social Consciousness Through Departmental Unity, H. P. Harshbarger 134
A Proposed Vocational Guidance Program, W. J. Dunning 136
Personnel Service in Industrial Arts, I. M. Fenn 138
Vocational Education for the Small Community, Delmer E. Everett 140
Qualifications of an Industrial-Arts Teacher, Eugene Giammatteo 23A
Pertinent Paradoxes, Dean M. Schweickhard 32A

Equipment and Supply List

Woodworking 16A
Metalworking 45A
Automotive 56A
Print Shop 60A
Electricity 70A
Drafting 76A
Shop Equipment News 28A
Personal News 38A
Association News 41A
New Publications 68A
Answers to Questions 83A
News Notes 84A

Articles Indexed — The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."

Entered Jan. 2, 1914, as second-class mail matter at Milwaukee, Wis., under Act of March 3, 1879. Copyright 1941, by the Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office, Nov. 25, 1930. Published monthly except during July and August.

Subscription Information — Subscription price, $2.50 per year, payable in advance. Canadian postage, 50 cents, foreign countries, 50 cents. Copies not over three months old, 35 cents; more than three months, 50 cents. Notice for discontinuance of subscriptions must reach Publication Office in Milwaukee, at least fifteen days before date of expiration. Changes of address should invariably include old as well as new address. Complaint of nonreceipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

Editorial Contributions — The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

PUBLISHED MONTHLY, EXCEPT DURING JULY AND AUGUST, BY THE BRUCE PUBLISHING COMPANY, 540 NORTH MILWAUKEE STREET, MILWAUKEE, WISCONSIN

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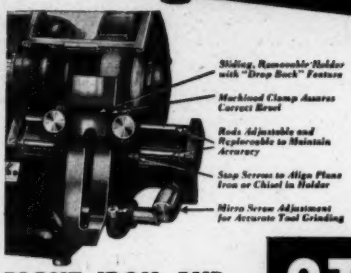
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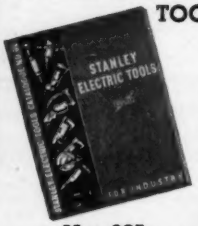

describes and illustrates the complete line of Stanley Electric Drills, Saws, Unishears, Grinders, and other tools.

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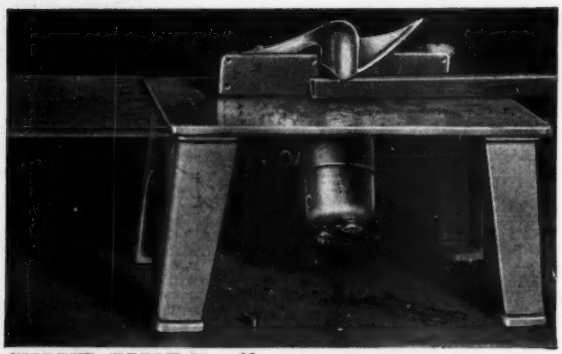
illustrates this tool and all of its attachments.



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School Shops

Laboratory of Arts and Industries

WILLIAM H. JOHNSON*

The Chicago schools provide a wide program of industrial education to meet the educational needs of the thousands of students who attend our day and evening schools. There has been a need in the upper grades of the general high schools for a shop course to meet the educational needs of boys who want to elect some advanced shopwork as a part of their education but do not wish to take a straight technical or vocational course. To meet this need we have developed a new laboratory of arts and industries.

The laboratory of arts and industries is an advanced shop and drawing course especially designed to meet the educational needs of boys in the upper grades of the general high school who do not wish to follow a straight technical or vocational course. The laboratory of arts and industries gives upper grade boys, who have had the industrial-arts laboratory course, an opportunity to become further acquainted with industry, its processes, workers, and vocational opportunities. It also gives boys in the upper grades of the general high school an opportunity to explore further their industrial aptitudes, to develop new skills, and to secure late scientific information about our modern technological world of work.

Objectives of the Laboratory of Arts and Industries

The major objectives of the laboratory of arts and industries are:

To further the boys' interests and understanding of modern industry, its materials, processes, and the social economic life that results. Living, as we do, in a machine age it is important to have a clear concept of modern industry and its workers as a part of modern culture. The boys in general high schools should have an opportunity to work with materials and machines typical of industry even though they may not earn their living directly in industry. However, many boys in the upper grades of the general high school have not chosen a vocation and may find their lifework in the industrial world where their advanced training in the laboratory of arts and industries will prove of real vocational as well as cultural value.

To give each boy an opportunity to follow his special industrial interest and to learn advanced operations and skills typical of modern practice in the trade or industry. The laboratory of arts and industries gives each boy with an interest in mechanical operations an opportunity to study the type of work on his level of accomplishment and to learn valuable skills and knowledge that may prove of great value in later vocational work. For example, students in the laboratory have an opportunity to melt iron, to heat-treat steel, to do electric and gas welding, and to learn the fundamental processes of running the machine lathe.

To develop consumer intelligence in the selection, care, and safe use of the products of modern industry. People today do not make everything they use as was the case with many of their pioneer forefathers. Due to the specialization of labor in modern industry, each worker makes only a small part of the commodities that are needed for his daily living or, perhaps, makes only a part of one item. However, he must choose among the many products of modern industry that are clamoring for his attention. Wise selection from these products to meet his daily needs is a challenging problem throughout life. The laboratory of arts and industries affords many opportunities to develop discriminating judgment about the products of industry and to establish standards of comparison based on materials, workmanship, and design.

To develop wholesome leisure-time interests in craftwork and industrial processes. The laboratory of arts and industries gives the boy an opportunity to learn crafts and to follow industrial interests that will prove of value during leisure hours. Some boys prefer to read about industry, its products, and its workers in their leisure time. But most boys like to make useful articles with tools and materials or to perform scientific experiments in their home workshop. In either case, the laboratory of arts and industries has much to contribute in the development of worthwhile leisure-time activities.

To give an increased appreciation of the place of design in machine-made products. Modern industry is giving more and more attention to good design for the machine age. In the planning room of the laboratory of arts and industries, the boys have facilities and equipment to create designs: and, in the laboratory they have the opportunity to shape materials with tools and machines to express, in concrete form, the plans they have made.

To vitalize training in all instructional areas of the high school curriculum by giving opportunities for learning through real experiments with materials and tools. The laboratory of arts and industries affords many opportunities for giving definiteness to learning in all instructional areas. It offers numerous occasions for stimulating reading and writing about the industries and their products. There are many problems to be solved here which give excellent cause for the application of mathematical principles to modern problems. The processes of industry afford an almost endless opportunity to apply the principles of the physical sciences. The work of the world offers many occasions to the social-studies teacher for the study of our modern social and economic problems.

The Laboratory of the Arts and Industries Course

The laboratory work of the arts and industries course is broad in scope, and the equipment is selected to give the upper-grade boy an opportunity to do advanced work in the various lines of his chosen interest. The instructional divisions of the laboratory of arts and industries give the boys an opportunity to explore and learn about a whole field of industry, as well as to learn the use of processes and materials on an advanced level. The laboratory course includes instructional areas in plastics, graphic arts, metals, power, communication, woods, transportation, and planning.

The graphic arts includes printing, bookbinding, etching, papermaking, photography, lithography, and silk-screen process. The metals area includes sheet metal, bench metal, foundry, machine operation, heat treating, welding, metal spinning, electroplating. The plastics area includes the molding of plastics, both with heat and by means of the hydraulic press, the working of bar and sheet plastics, as well as a study of the plastic industry. Power includes the study and application of steam, water, wind, and electrical power to industrial and domestic use. Communication includes radio, telephone, telegraph, and television. Woods include cabinetmaking, carpentry,

*Superintendent, Chicago Schools.

patternmaking, and a study of wood products and the woodworking industries. Transportation includes a study of automobile, railroad, airplane, and water transportation. Here emphasis is on safety education and consumer appreciation. Planning includes those activities of reading, discussing, and drawing which are necessary in the beginning stages of any project.

The laboratory of arts and industries course is taught in a well-equipped laboratory which is divided into three major divisions and is under the supervision of two teachers. One of the major features of the laboratory is a planning center equipped for visual education, demonstrations, drawing, and reference reading. The planning center is separated from the rest of the laboratory by partitions and is used by both teachers according to the needs of their boys. One half of the laboratory is equipped for working in the areas of plastics, woods, and the graphic arts under the supervision of one teacher. The other half is equipped for working with metals, communication, transportation, and power under the direction of the second teacher. The laboratory is acoustically treated to prevent interference from noise in the machine and tool operations. The equipment is placed to take advantage of natural light, and good artificial light is provided for use when needed. Machines are well guarded and storage

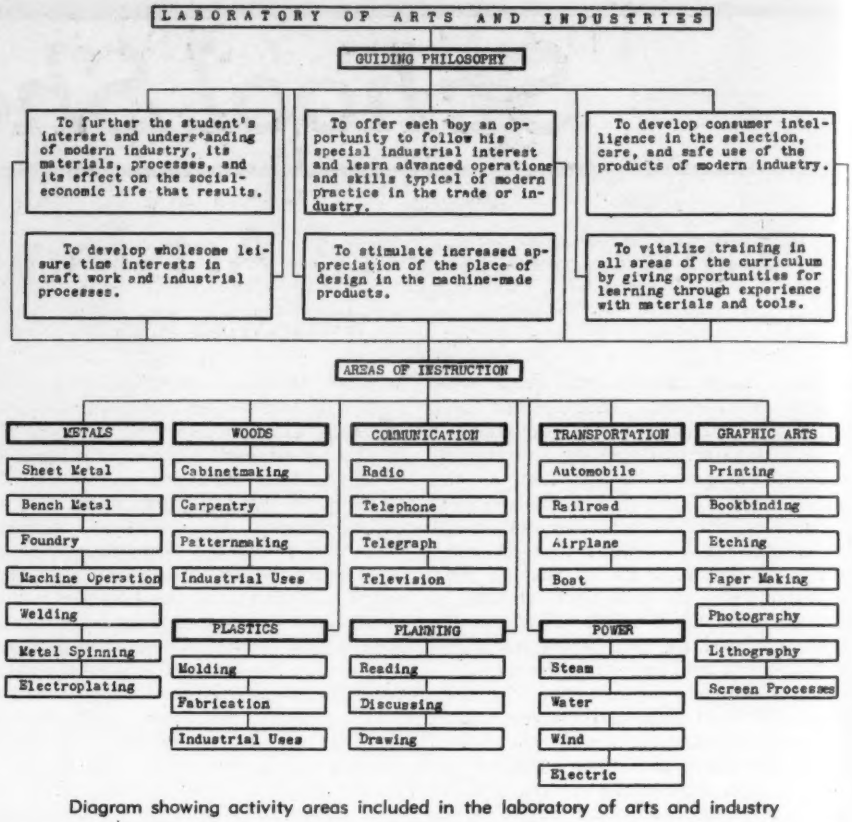
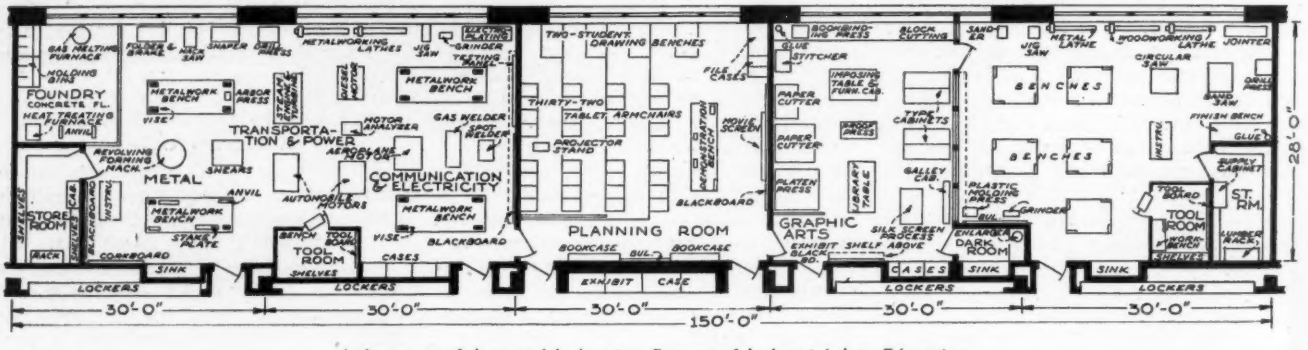


Diagram showing activity areas included in the laboratory of arts and industry



Laboratory of Arts and Industries, Bureau of Industrial Arts Education

space is provided for tools and materials. Adequate aisle space is left around all benches and machines to give convenience and to provide safe working conditions for the pupils. The accompanying layout shows a typical floor plan for a laboratory of arts and industries.

The laboratory of arts and industries is an advanced shop course. At least 75 per cent of the boys' time is spent in active learning involving the use of materials, tools, and machines. A fourth of the time is devoted to related activities which include well-planned trips to industry, motion pictures, reference reading, demonstrations of tools and materials, planning discussions, related reading, and making drawings for construction activities.

The boys are encouraged to follow their interests and are given opportunities to do creative work. However, their creative efforts are based on a sound knowledge of the materials, scientific principles, and tool and machine operations fundamental to the needs of the problem under consideration.

The boys in the laboratory of arts and industries are taught the correct methods of operating machines and of using hand tools; and they are expected to produce work that is in keeping with their ability. Many of the skills developed in the laboratory will prove of value in future vocational activities should the boys choose an industrial career.

Boys electing the laboratory of arts and industries course are given instruction five double periods a week. They may elect the course one to four semesters, depending on their interests and their ability to profit from instruction in this field.

FALL AND WINTER STYLES

This might be a discussion of fur coats and top hats — but it isn't. It is just a word on the common-sense way to dress in accordance with the season; and right now, or a little later, the season will call for warm clothing, sound shoes and gloves — and even, perhaps, ear muffs.

A person who is numb from the cold is somewhat like a blind or deaf man and is a good possibility for an accident. Cold fingers drop tools, and feet that are very cold or numb trip or stumble much more easily. Exposure to bad weather weakens the resistance and causes sickness, and when a person isn't feeling well, accidents are more likely to happen.

Clothes do help to make the man, safe. Proper clothing makes a person more comfortable and more efficient at his work.

— *Milwaukee Safetygram.*

The Trades and Industries Building at LaCrosse

JOHN B. COLEMAN and W. F. OPPERMANN*

The new trades and industries school building at La Crosse approximates the regular industrial shop in its organization and in its expansion. La Crosse did not build additional laboratories but rather increased the facilities, floor space, and equipment for shops it already possessed. In short, the school doubled its capacity without increasing the number of its shops and with only a nominal increase of equipment.

The La Crosse vocational and adult schools have three departments. An addition to the school plant was built in 1939 to house the college of commerce and the homemaking departments. The former building was turned over to the trades and industries department and remodeled to suit its needs.

In order to understand the layout, equipment, and operation of the trades and industries section of the La Crosse institution, it is necessary to have some familiarity with its underlying philosophy. The institution pursues the policy of making the training situation as nearly as possible similar to the real situation in the trade or industry for which the training is given. This trend has produced a trades and industries school that is different. Ordinarily, courses in industrial arts and vocational education have been organized by schoolmen from an academic classroom viewpoint, with the result that the academic classroom pattern is carried over into vocational education. In a typical school situation where everyone in class studies the same page, in the same size desk, at the same time, the idea seems to have been formed that if a class of 30 boys is to learn soldering, for example, there must be 30 furnaces and 30 soldering coppers so that the instructor can hold an entire class and teach the same thing to all at the same time. When the pattern is taken from trade and industry, however, industrial practices rather than general school practices determine the direction of training.

In industry, different men are doing different things at different times. The working personnel is not graded, but highly diversified in intellect, education, training, experience, and skill. It is an arrangement necessary to the functioning of an industry, and the La Crosse vocational and adult schools have followed a trend in the same direction as a result of their continuous endeavor to follow a training setup similar to the trade or industry for which the training is given.

A head instructor, assistant instructors, and specialized instructors, correspond to the head of the department, foremen, and assistant foremen in industry. Shops are provided with equipment of the same type as industries would use, and the equipment is rated for use-efficiency in terms of work hours it performs. It is easy enough to find a school shop housing equipment that is not used for months, and some that is never used, until instructors get around to the point in the course of study which includes this equipment. In other cases there are 2 to 30 pieces of the same equipment on hand for the purpose of keeping everybody on the same process at the same time. Or again equipment is duplicated because of a duplication of shops requiring a representation of each type of machine regardless of the working hours delivered by the machine. At La Crosse a general effort has been made to put a piece of equipment to work for its maximum hours before a duplicate piece is purchased.

Training directed by the industrial pattern makes a boy's life at the La Crosse vocational and adult school the opposite of the general schoolroom pattern. A boy is placed in one shop and under an instructor for the entire day. He receives training for a chosen occupation throughout the day. Related subject matter, reference work, and personal improvement all grow out of the shop procedure and shop instruction. Industrial habits, industrial hours, and industrial discipline are in vogue. The student gets some impression of how an industry functions, and how he might function in the industry, because he gets a six-hour stretch at the glue bench, the forge, or the lathe. He could not get the same impression making a pedestal with one little operation following another, though it is admitted, of course, that he may be training according to a method which is excellent from the standpoint of general learning.

In many instances several vocational and adult school shops cooperate as do the departments in a factory. There is a follow-through from designing, to drafting, to patternmaking, and machining. Recently, high stools were built for use in the school's drafting room. They were requisitioned from the general metal shop

*Director and Co-ordinator respectively, La Crosse vocational and adult schools, La Crosse, Wis.

Cabinet Shop. A second shift may continue with the work these boys are doing

Finishing Room. Glue room, shop office, and cabinet shop are seen through glass partitions in the back of the picture

Machine Shop. Industrial habits, industrial hours, and industrial discipline are in vogue

Section of lathes in machine shop

to be made of welded ½-in. pipe with wooden tops. To produce these stools, it was necessary for the general metal shop to requisition the cabinetmaking shop for the proper number of turned and finished wood tops to be produced according to specifications. Co-ordination of this type is similar to co-ordination of departments in industry. Processes that can best be done in one shop need not have a duplication of equipment for this job in another shop.

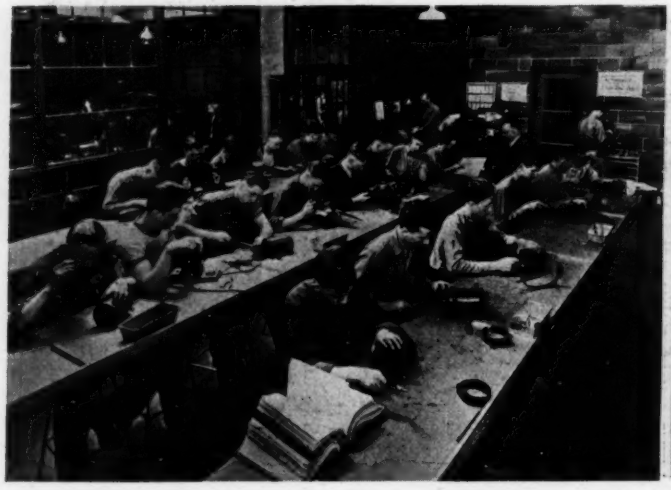
The La Crosse vocational and adult schools, in short, aim to make the school days resemble as much as possible, the workdays of life in which the student must later function and live. Training is designed to enable the youth to answer the question "Just what can you do in this world?" That philosophy reflects itself everywhere in the La Crosse shop setup.

Department Head Responsible

A head instructor or department head is in charge of each shop. He is responsible for selecting and receiving the work to be done, for organizing the instruction, and for programming students within the shop. There is, however, a major variation from the procedure in industry. In industry, production is primary and the training of personnel is secondary, and in the school situation the training of personnel is primary and production becomes secondary. Therefore, the first aim is to use production to train personnel rather than using personnel to secure production. The student is assigned to the head instructor whose duty then is to see that the student is given whatever experiences, training, and instruction are necessary to make him employable in the craft or industry that the student has selected. Since each student differs somewhat from his fellows when he comes to the instructor, and since the objectives are varying, it necessarily follows that the head instructor has an individual job to carry out with each student.

The head instructor will use his assistants either for general or for specialized work. In automotive industries, for example, one assistant is assigned primarily to body, fender, and service work, and one to related instruction and general repair. The head instructor himself gives instruction in technical trade extension and tune-up work. In the cabinet shop, assistants are used to teach certain shifts at certain hours. The school is in operation eight hours per day and two hours in the evening, and a division into shifts is more readily adaptable to this shop where the work cannot be divided into specialties as it is in the automotive shop. In machine shop, the head instructor lays out the work, provides most of the demonstrations, and uses the assistant instructor to assist in supervising boys in carrying out the shopwork.

A most efficient use of equipment does not call for a number of classrooms all equipped alike. The La Crosse shops have expanded through increasing floor space



Automotive Industries Laboratory. Advanced specialized work follows general service and repair. Note shop behind glass partition

Automotive Industries Shop. Assistant instructor handles body and fender washing, and lubrication in further end of the shop

Section of general metal shop

General Metal Shop. Different workers are doing different things

and equipment. Not a single additional shop was built. The procedure of industry is similar. Industry will not build an additional factory but will increase the size of its plant. During the times of expansion, industry will run longer hours or more shifts. When the industry is slack, short hours prevail, and personnel is reduced, but the entire plant is always in use except in the event of a complete shutdown.

The La Crosse vocational and adult schools use assistant instructors, call staff, and substitute instructors. On occasion they have had one general shop instructor who can serve as an assistant in many shops and classroom situations. Evening instructors are taken directly out of industry or employment to fit into specific situations. The main corps of instructors carries on regularly, and other instructors may be called in as needed.

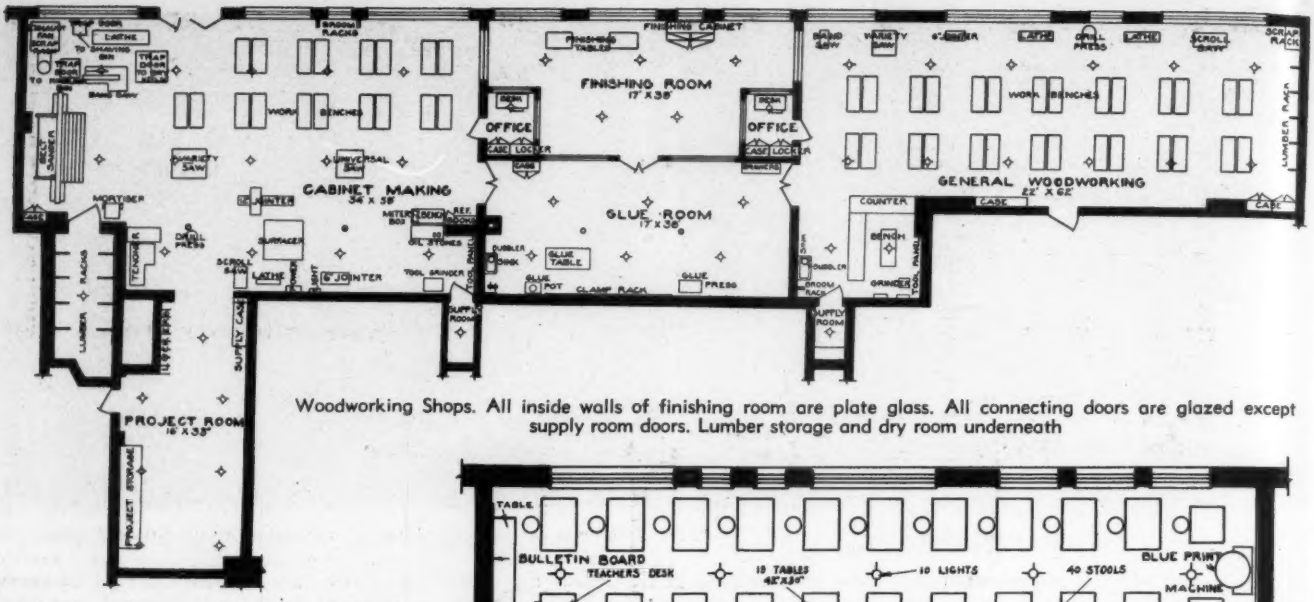
In an adult school such as the vocational and adult schools at La Crosse, the training load will vary considerably throughout the year from season to season and from time to time just as the production load in industry varies. Students enroll every week of the year and students leave the school every week of the year. A class that enters in September may have an entirely changed personnel by the following June. Students enroll full time or for such spare time as they have available and according to their occupied or working hours. They may enroll for Monday, Tuesday, for Thursday and Friday, for Tuesday and Thursday, etc. Others enroll one day a week, some for half time, and some for two afternoons only; and all these different enrollments are handled in each shop each day of the week. School service of this type calls for a high degree of flexibility in teaching organization and in the organization of equipment and facilities. Students also vary decidedly in their previous attainment, in skills, intelligence, and education. The variation in the load may have 15 students enrolled in the machine shop at one time and 75 at another. The provision for elasticity therefore is most essential.

The Woodworking Shops

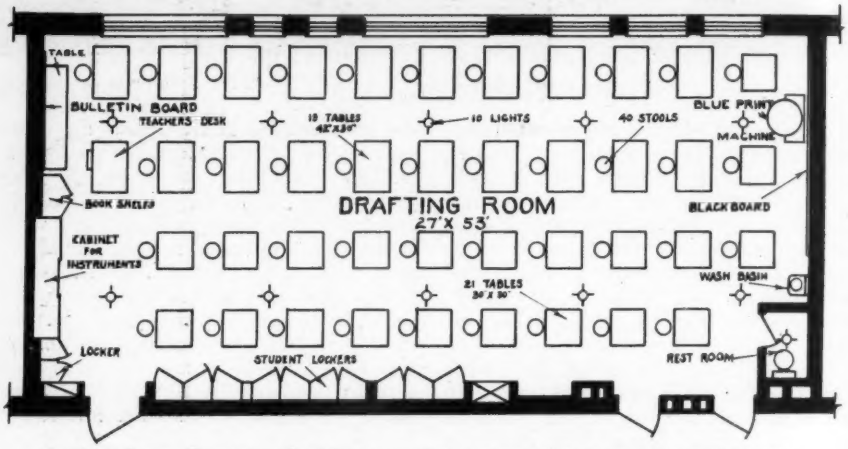
The reader may refer to the floor plan of the woodworking shops and note a cabinet shop at the left and a general woodwork shop at the right with finishing room and glue room between the two. The cabinetmaking shop is used primarily for senior students and the general woodworking shop for junior students. The glue room and finishing room are used jointly. Production from both shops will converge in the glue room and finishing room. Two offices are shown. The head instructor is in the office at the left. From his office

Acetylene welding line in general metal shop

Electric welding line in general metal



Woodworking Shops. All inside walls of finishing room are plate glass. All connecting doors are glazed except supply room doors. Lumber storage and dry room underneath



Drafting Room. Two sizes of tables are used to accommodate large and small drawings

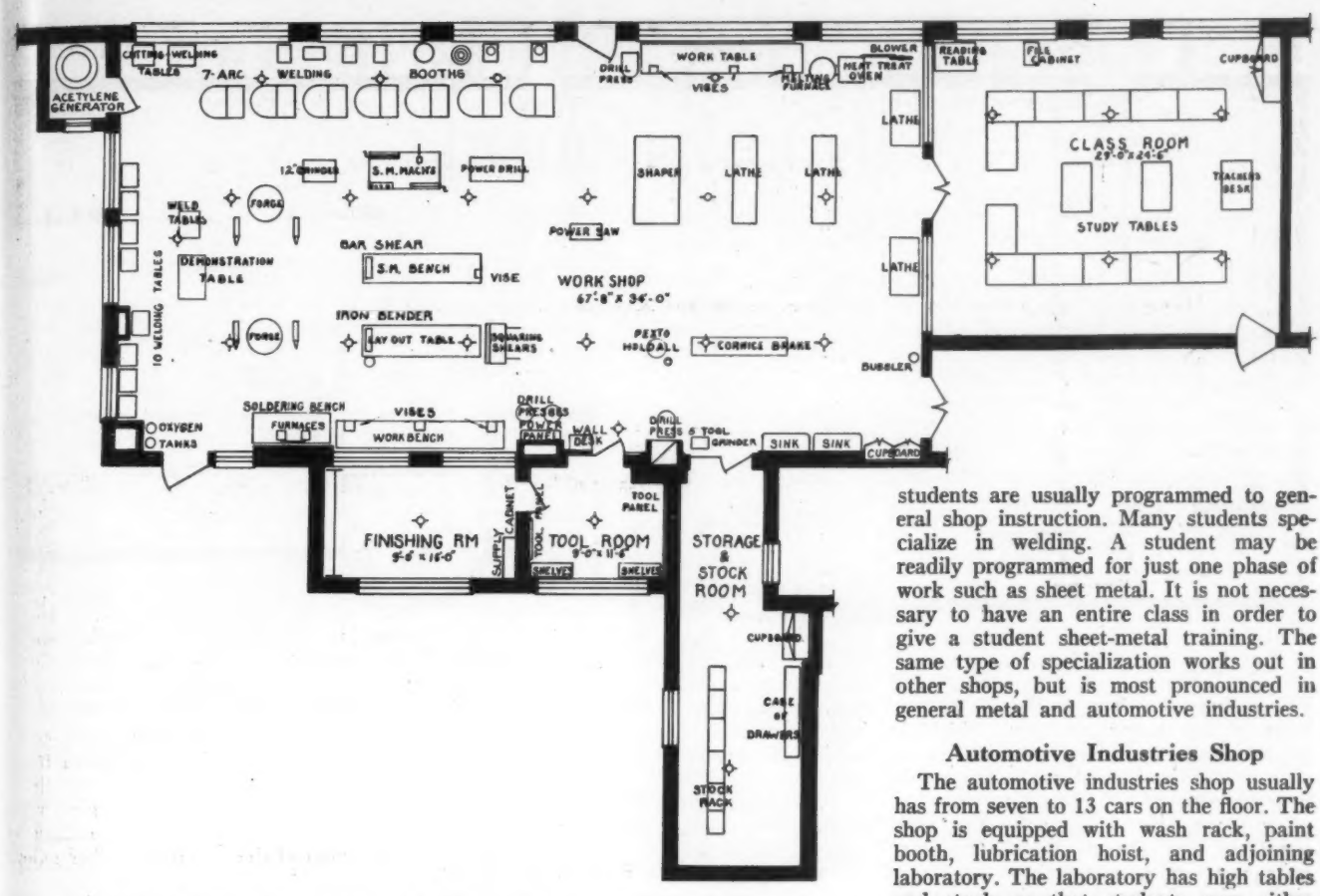
location or from any location within the layout, he has a view of adjoining rooms. The doors between rooms are glazed. All inside walls of the finishing room are built with plate glass. This is a splendid supervisional arrangement for any instructor responsible for student personnel in the various parts of the layout.

The head instructor in this shop who happens to be supervisor of the trades and industries department has an extension telephone in his office connected with the outside. He also has a house telephone. It is his duty to take the work for the shops, to plan the purchases, and to route production work and organize instruction. He has exceptional liberty in the purchase of supplies, since his primary responsibility is the improvement of student personnel, and, it must not be forgotten, in production work the consumption of supplies produces income for the shop.

The reader may, in looking over the woodworking shop layout, note the adjoining project room, the lumber room, and supply rooms. Beneath the shop is a lumber storage and dry room. There are lockers in the shop where students exchange their work aprons and overalls with outside clothes as they come and go. More lockers are in the corridor just outside the door of the general woodworking shop that are not shown in the layout. The shops have two bubblers, two wash sinks, numerous cupboards, cabinets, drawers, and racks for the efficient handling of materials. The offices provide instructors with a place for keeping their various papers, books, clothing, and the like, away from the dust of the shop. It also provides some privacy and an opportunity to escape shop noise. References are kept in the shop where they are directly available for student use. Lock and key control is provided for

Drafting Room. Ten 750 watt light bulbs. All light indirect

Press Room. The press room is adjacent to the composing room. Plate glass partition connects the two



General Metal Shop. Machine shop, sheet metal, forging, heat treating, electric and acetylene welding. Plate glass separates classroom from shop

all cupboards, cases, and supply rooms. Tool panels are kept in the open as a preferable means of control. Blackboards and bulletin boards are distributed throughout the shops but are not shown in the plan.

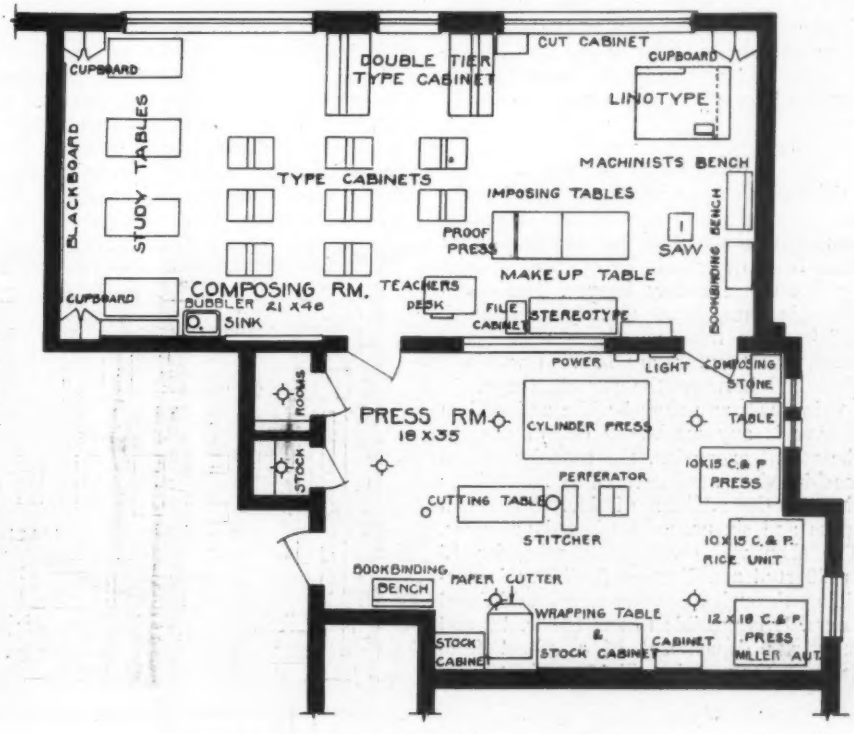
The General Metal Shop

The general metal shop is laid out for instruction in machine shop, forging, sheet metal, heat treating, electric welding, and acetylene welding. A head instructor and an assistant are in charge. Included in the layout is a classroom with tables, separated from the main shop by plate glass in walls and doors. The instructor has a complete view of his shop from the classroom and vice versa. This shop has all the conveniences mentioned in connection with the woodworking shops, including a house telephone. Production shops have much contact with other departments, with the office, and with the outside so that communication facilities, such as telephones, are highly necessary. Incidentally, the building is equipped with an inside public-address system with talk-back facilities.

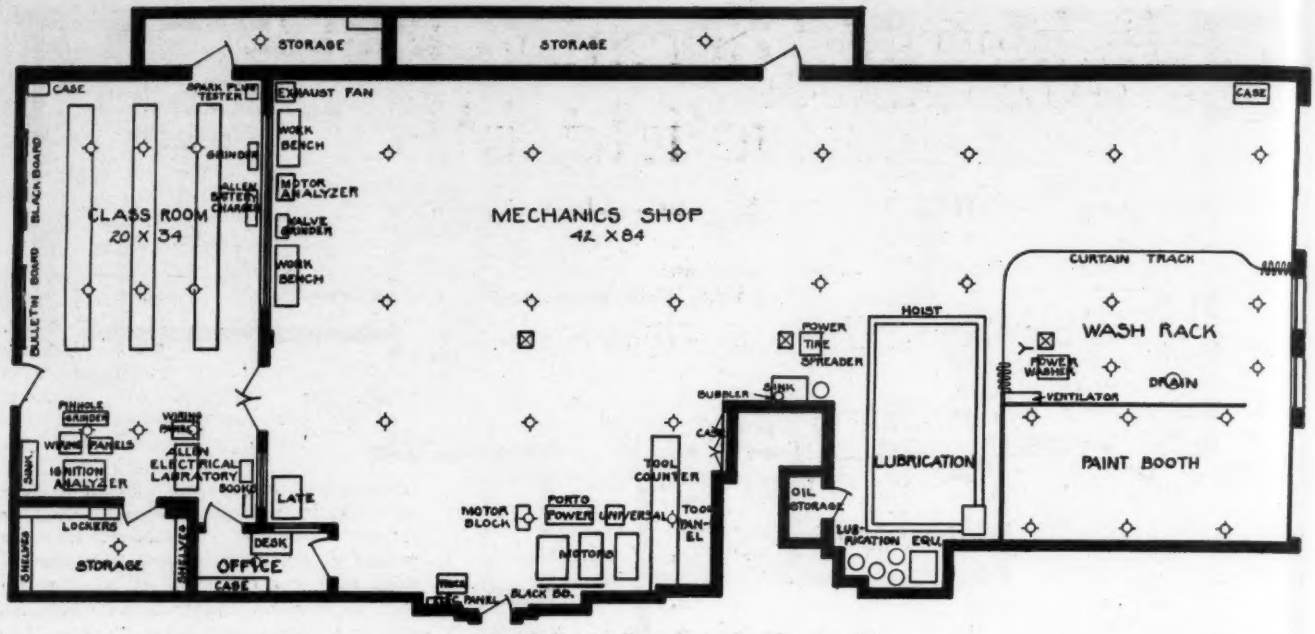
Instruction in the general metal shop may be specialized or generalized. The shop is used by junior students, senior students, and evening adult classes. Junior students are usually programmed to general shop instruction. Many students specialize in welding. A student may be readily programmed for just one phase of work such as sheet metal. It is not necessary to have an entire class in order to give a student sheet-metal training. The same type of specialization works out in other shops, but is most pronounced in general metal and automotive industries.

Automotive Industries Shop

The automotive industries shop usually has from seven to 13 cars on the floor. The shop is equipped with wash rack, paint booth, lubrication hoist, and adjoining laboratory. The laboratory has high tables and stools so that students may either stand or sit while they do their laboratory work. Certain machines, such as the igni-



Print Shop. Fluorescent light is used in composing room



Automotive Industries Shop. Room for 13 automobiles

tion analyzer, are kept in the laboratory; whereas the motor analyzer, which is used on the motor in the car, is on the main shop floor. The laboratory and the main floor are separated by glass partitions. The office for the head instructor has glass partitions and glazed doors. The head instructor receives automobiles for repair and service. He handles the business work of the department and is responsible for the assistant instruction. Training is highly flexible, and students are programmed according to the individual's time and need. Some prepare for service work, others for body and fender, and others for general tune up and repair. Trade extension and advanced students are given laboratory work.

Other Departments

The print shop, machine shop, and drafting room are laid out in line with the same general philosophy as the shops that have been described. Everywhere elasticity is an outstanding feature. The variations in enrollment already mentioned, which occur from month to month and from year to year, are handled within a shop and between the various shops. At no time will any shop be idle and seldom if ever is any machinery out of use. In the recent expansion, the capacity of the machine shop was increased by 20 students through the addition of floor and bench space and six properly selected machines. The shop will give good service for 15 or 50 students. Further flexibility is possible through programming additional hours. It is possible to run the trades and industries department of a school from seven in the morning till 10 at night much the same as an industry can be run. An overload in machine shop may result in a shift to more drafting for machinist training and more related work in the general classrooms. For small classes, practically all related work is done in the shops.

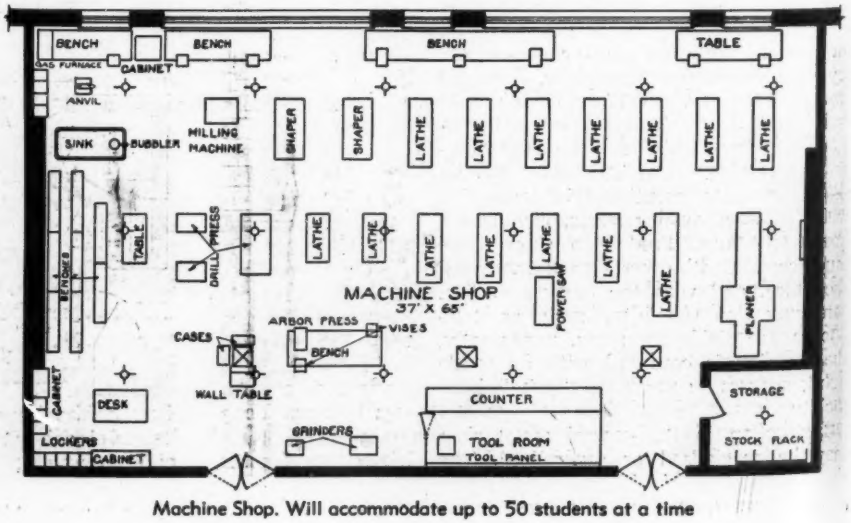
The trades and industries department, while it is connected directly to the addition which houses the other departments, is, nevertheless, quite entirely a building in itself. It is two stories high and forms a complete square of shops and classrooms with gymnasium, toilets, and locker rooms in the center. The general offices of the school are also located in this square. The school has an auditorium with over 1200 seats for general assemblies of the school, and the trades and industries department has its own double room for purposes of trades and industries assemblies. The trades and industries staff includes one general subjects instructor who is in charge of the school library which adjoins his general classroom.

DEFENSIVE DRIVING

The defensive driver will:

1. Maintain an area of safety in front, back, and on both sides of his vehicle.
2. Forget about who has the legal right of way and do the common-sense thing by keeping out of the way of the other fellow.
3. Adjust his driving speed to:
   (*a*) Condition of road surface;
   (*b*) General traffic;
   (*c*) Visibility.
4. Assume that the other fellow (driver or pedestrian) is deaf, dumb, blind and knows nothing about traffic laws. — *Milwaukee Safetygram.*

Above all, don't be idle. If you cannot work for others, do something on your own account. You have creative power, once you are sufficiently stirred to exercise it. — *Owen D. Young.*



Machine Shop. Will accommodate up to 50 students at a time

Industrial Education Building, Springfield, Mo.

HARRY P. STUDY* WILLIAM B. ITTNER, Inc.**

The Industrial Education Building is located on Benton Avenue north of the Fine Arts Building and is part of the Springfield, Mo., senior high school.

The building is constructed with reinforced concrete columns, concrete floors and roof. The walls above grade are brick in harmony with other buildings on the site. The bricks are variegated in color from light red to purplish black, laid in garden wall bond with Bedford stone trim at the entrances, window sills, and copings. The windows are of metal, projected type; interior walls of glazed brick.

All floors are trap rock finish, except drawing rooms and library which are mastic tile. Toilet floors are ceramic tile. The plumbing is of modern type and the heating by unit heaters, steam being supplied from the main boiler plant.

The electric wiring is set in rigid conduit, and has been approved by the National Board of Fire Underwriters.

The educational planning for the building was initiated by Superintendent Harry P. Study, and the plans were completed with the approval of Dr. N. E. Viles, State Director of School Buildings for Missouri. The board of education in charge is as follows:

E. P. Burman, president, L. D. Rosenbauer, Dr. C. E. Feller, Guy A. Cowden, Claud H. Rathbone, Paul H. Jezzard, A. R. Stewart, secretary.

Mr. J. D. Hull is principal of the high school and Mr. Robert Runge supervisor of industrial education. William B. Ittner, Inc., acted as architects and engineers.

The building is part of a project consisting of an Auditorium-Cafeteria Building and Athletic Field House, and was financed through a Bond Issue and a PWA grant. It contains 380,000 cu. ft. and the cost was as follows:

General	$74,352.68
Plumbing	4,249.72
Heating	9,197.89
Electric	4,534.71
	$92,335.00

Approximately $24,028.14 was expended for equipment.

This school comprises all of the 10th, 11th, and 12th grades in the city. The enrollment totals 2601 of which 1263 are boys. Boys enrolled in the classes in this department number 742 and some 50 girls are in art and mechanical-drawing classes.

Most of the classes in this building meet the demands of pupils for general mechanical training; however, opportunities are offered for more extensive training along the lines of special desires or aptitudes for some pupils.

Previous to the expansion of the department and planning of the new building much time was spent determining just what should be included in the program. Local leaders of labor and prominent businessmen were invited to meet with the board of education and schoolmen to get their reaction to the proposed improvement and also to try to find just what employers expected of young people entering industry. From these meetings many ideas were assembled for incorporation into the course of study. Information about what graduates of the high school were doing was obtained from survey which was made with the help of pupils. We found what these people were doing, what studies had helped them most on the job, and if there were things within the range of the department to help them more — what these things should be. Trends in the field of industrial education are important. A leader in the field from outside the state was brought in; also men from the state university at Columbia, Mo. Visits made to several new high schools in larger cities gave us an idea what other communities had done along this line.

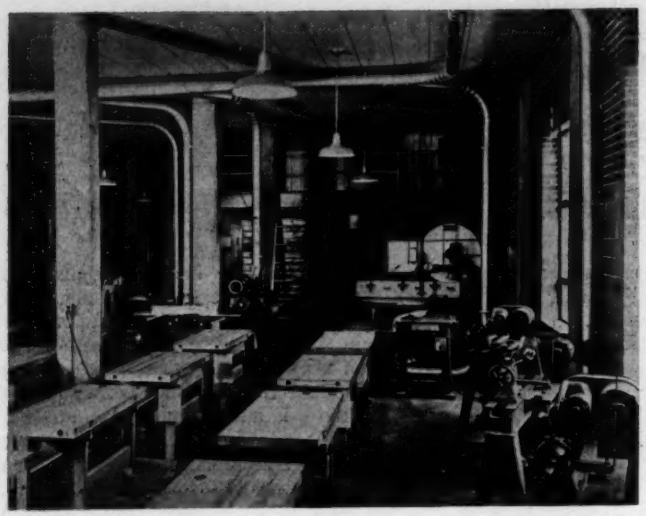
Careful consideration of all of the planning material gotten from meetings, visits, and consultations indicated that the training offered should be of a general nature. All of the evidence both local and national pointed to the fact that too specific training for special occupations really limited the student in his choice of a job. It seemed advisable to give the greater group of young people a general training along mechanical lines with the attendant related information about industry and industrial life. For instance in a general metal shop a boy should get the kind of skills and information that will enable him to go to a tinsmith, a railroad shop, a foundry, a metal novelty shop, and the like, and be able to perform simple operations and conduct himself with some degree of assurance and intelligence. Pupils whose desire it is to get a definite type of training may do so by entering the vocational classes.

It is significant that in giving to industrial arts this increased physical space and the increased curriculum importance there is a consciousness that this type of work is taking its place as an integral part of the

*Superintendent, Springfield, Mo.
**Architects & Engineers, St. Louis, Mo.

Exterior view, Industrial Arts Building, Springfield, Mo.

Mechanical drawing room, Industrial Arts Bldg., Springfield, Mo.



Vocational woodworking shop, Industrial Arts Bldg., Springfield, Mo.

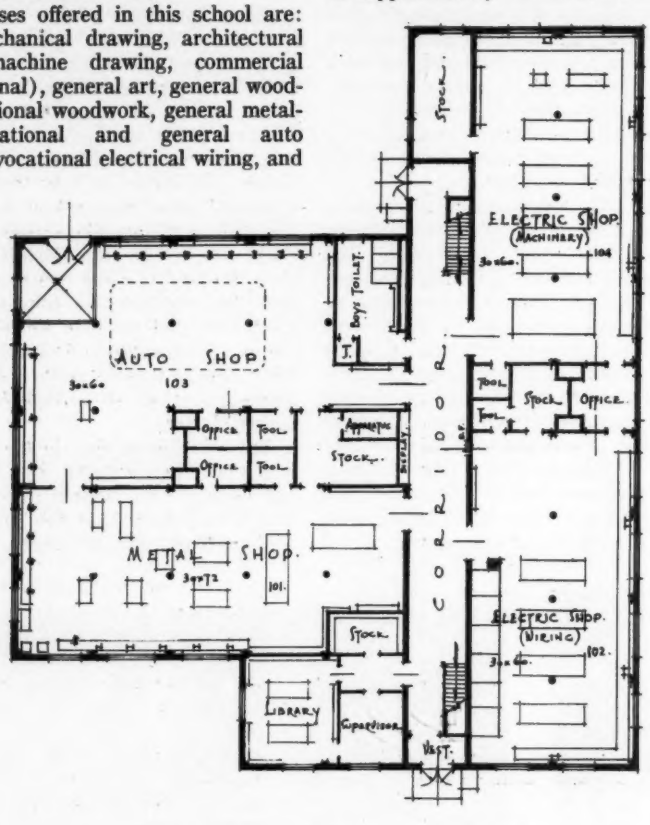
Vocational woodworking shop, Industrial Arts Bldg., Springfield, Mo.

high school program. In Springfield we believe it should be a part of every pupil's education.

Courses Offered

The courses offered in this school are: general mechanical drawing, architectural drawing, machine drawing, commercial art (vocational), general art, general woodwork, vocational woodwork, general metalwork, vocational and general auto mechanics, vocational electrical wiring, and general electricity, vocational electrical machinery and general electricity.

In conjunction with the industrial-arts department several classes are conducted in other parts of the school. There are as follows: co-ordinator of employed boys, co-ordinator of employed girls, and co-ordinator for the colored pupils. These have pupils in their classes who work as much as 20 hours per week. The classwork is supplementary to the student's employment and covers such matters as personal relationships, workers' problems, and specific job information.



GROUND FLOOR PLAN
Scale 1/16 = 1'-0"

A new class in vocational commercial photography is getting under way and promises to be popular with boys and girls.

Most of the equipment in the building is new and the amount that could be expended for this purpose was generous enough to allow installing up-to-date and first-quality machinery and tools. It may be worthy of noting that one of the woodshops is equipped with light machines; the other with standard heavy-type machines. The latter serves the vocational group and the reason for providing heavy machinery is apparent.

Features of the Building

1. Large shop rooms, all have 30 by 50-ft. floor space. Cramped quarters are responsible for accidents where tools and machines are part of the equipment and active boys, often thoughtless, are the workers. Interference of one boy with another is as far as possible eliminated.

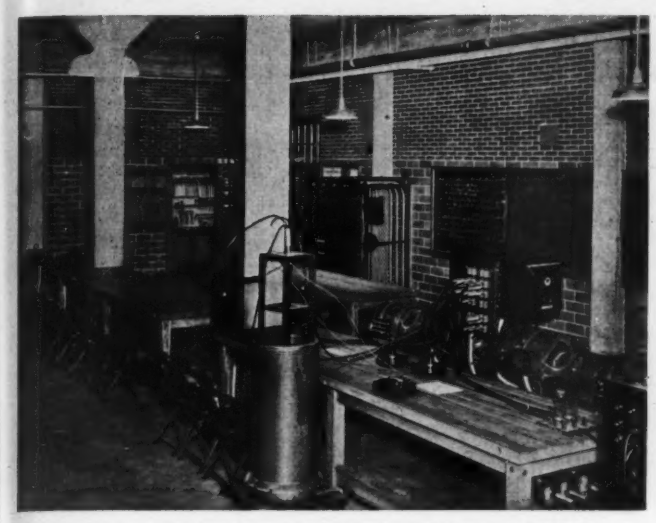
2. Stock rooms in connection with all shops are adequate for the storage of a year's supply of stock and materials.

3. Finishing rooms are connected with the woodshops so that all finishing processes may be carried on away from the attendant dust and dirt of the shop. Storage shelves are large and open, so that they can accommodate all individual class projects. Metal topped tables are provided for all finishing work.

4. Toolrooms are provided for each shop with the necessary tool panels to hold all of the general tools used. Tool panels are of two types, those mounted on the floor and those fastened against the wall. Drawer spaces beneath the floor panel are enclosed to contain small supplies which must be dispensed by the tool keeper.

5. A glass-front office or workroom for the instructor is a part of all rooms, so that job sheets and special teaching devices may be kept at hand yet out of the dust of the shop room. Each of these offices is equipped with desk, chair, and a four-drawer file. A book and wardrobe case also is provided for personal use.

6. The mechanical-drawing room, a special adjoining room with very fine fa-

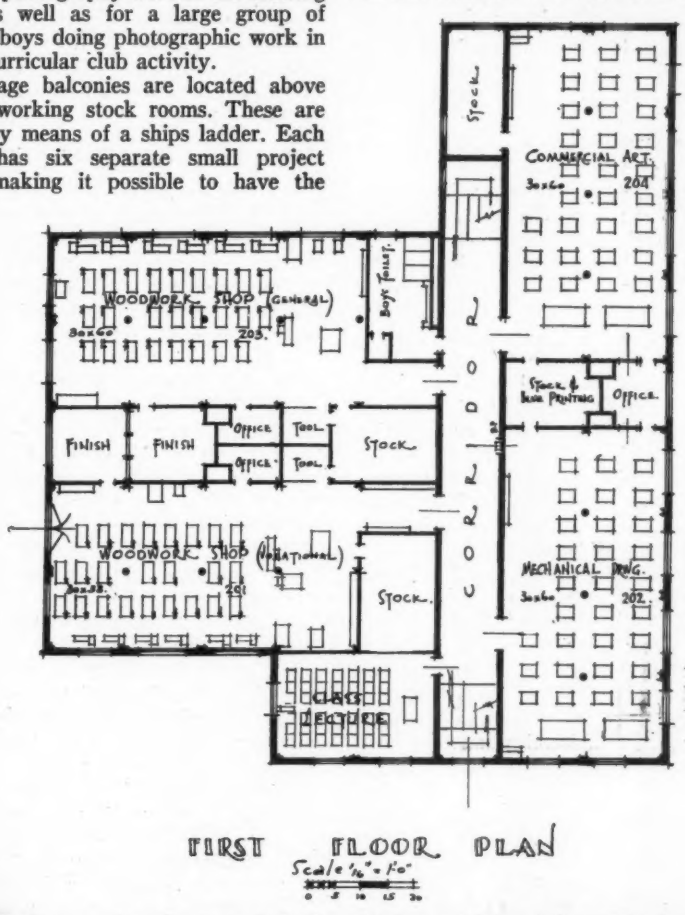


Electrical machinery shop, Industrial Arts Bldg., Springfield, Mo.

Auto shop, Industrial Arts Bldg., Springfield, Mo.

cilities for storage of drawings and tracings, houses an up-to-date electric blueprinting machine. A large stone sink with attached drainboards serves the purpose of print washer. This room is also used for the necessary photography work in the drawing classes as well as for a large group of girls and boys doing photographic work in an extracurricular club activity.

7. Storage balconies are located above the woodworking stock rooms. These are reached by means of a ships ladder. Each balcony has six separate small project lockers, making it possible to have the work of all classes using the room locked away securely.



FIRST FLOOR PLAN

Scale 1/16" = 1'-0"

8. On the second floor, easily accessible for use on schedule, there is a recitation room for classwork which can be best conducted outside of the shop. Forty-two tablet-arm chairs, a desk and chair for the instructor, and adequate blackboard complete the equipment.

9. Valuable to the carrying out of industrial education are the books and periodicals containing informational materials pertaining to the kind of work being done. On the ground floor is the nucleus of such a library. Shelf room for 1200 volumes lines the walls. Large tables and chairs provide study space. Here the books of this nature are not hidden among the books of the general library, but are readily accessible for the use of the department.

10. A well-lighted display case in the ground-floor hall gives an opportunity to show the public and the pupils in high school smaller projects that are currently made in any of the shops or classes. The case has glass sliding panels for the front and the shelves are plate glass. Aside from the publicity angle there is inspirational value in the displays of the work.

General hardware trimmings throughout the whole building are of attractive black oxidized brass finish. The locking system is unique in that every lock in the building, whether it be room door, toolroom, or what not, is keyed alike for the particular room, and then master-keyed for the building. Custodians, as well as teachers, administrators, and the superintendent of buildings carry only one key.

The lighting of all rooms both artificial and natural, is adequate and well directed. Large windows of pleasing design are constructed for indirect ventilation.

Heating is by unit type heaters with satisfactory adjustment possible for each room according to the needs for intake of outside fresh air.

Halls as well as individual rooms have tack panels for the posting of announcements, etc. Rooms are supplied with blackboard space as needed.

CONSIDER THE HAMMER

It keeps its head.

It doesn't fly off the handle.

It keeps pounding away.

It finds the point, then drives it home.

It looks at the other side too, and then clinches the matter.

It makes mistakes, but when it does, it starts all over.

It is the only knocker in the world that does any good.

If you are inclined to lose your head and fly off the handle: *consider the hammer.*

An Arts and Industries Laboratory

H. D. THOMAS*

Cambridge, Ohio, has a population of 17,000 with a four-year high school attended by 1100 students. The principal industries are: potteries, glass plant, furniture factory, molded plastics, and coal mining machine industries.

The arts and industries laboratory of the public schools at Cambridge, Ohio, was completed in April, 1939. It was not patterned after any one program but was designed to meet local needs. A number of industrial-arts developments, as well as trade schools and industrial plants, were visited throughout the state and some outside the state. This visitation was carried on for the purpose of studying equipment, buildings, organization, and the like. It took nearly two years to complete this preliminary planning. The four members of the present teaching staff shared in the planning: Bruce Beymer, Paul Lerner, Charles Rawlins, and Dale Thomas. The advice and encouragement of Superintendent Hugh R. Hick and of the members of the board of education was invaluable. Dr. William E. Warner and many others contributed to the planning.

After the preliminary study was completed, the instructors entered upon the task of selecting the areas to be represented in the laboratory. Next came the locating of these areas and preparation of scaled floor plans showing equipment layout. A study of building materials followed. Much time was spent in writing specifications for the equipment.

The data collected while visiting other schools and industrial plants proved quite helpful for both the planning of the building and the selection of equipment. The cooperation of local industries and tradesmen was invaluable.

The development consisted of the remodeling of the former industrial-arts building and the construction of an annex, making about 8000 sq. ft. of floor space in the present building. The building cost was $40,000, and an additional amount of $20,000 was expended for equipment. Through the cooperation of the instructors and the architect the building materials were carefully selected and the specifications were written with regard for the latest approved developments.

The shop areas are lighted to an intensity of 35 foot-candles at table height with the glass-steel diffuser type of fixture mounted on trolley ducts. The value of this type of installation lies in its flexibility, which permits concentration of light where it is most needed. The printing, drawing, library, demonstration room, and office rooms are lighted with the indirect silvered bowl type of fixture to an intensity of about 50 foot-candles at table height. Localized and specialized lighting is also employed where needed throughout the laboratory. For example, in the finishing room and at the spray booths, explosion-proof fixtures are used. Over the imposing table, a Benjamin "skylight" unit is used. Holophone blackboard lights are being used over the blackboards and bulletin boards. The display case is equipped with fluorescent units.

The floors of the printing, drawing, photography, library, lecture room, and the office are covered with battleship linoleum. The floor of the ceramics, metals, and transportation areas are quarry tile. The remaining floors are maple. Acoustical plaster was used throughout the laboratory. The ceilings are white. The walls a light green tint. The wainscot is of light green mat-glazed tile, slightly darker than the walls. The steel cabinets and lockers are olive green.

The following areas are embodied in the laboratory: transportation, machine shop, forge and heat treating, oxyacetylene and electric welding, foundry, sheet metal, art metal, wrought iron, electricity, radio, woodworking, upholstery, ceramics, drawing, commercial art, photography, and printing.

The benches are the locker-base type, providing some 250 individual lockers, all of which are equipped with combination locks.

The principal equipment of the transportation area is as follows: Weidenhoff engine analyzer; Weidenhoff distrib-U-scope; Weidenhoff exhaust gas analyzer; Weidenhoff armature growler; Hall valve shop; Sunnen pinhole grinder; United Motors Act-U-Vac; Weaver camber-caster-kingpin gauge; Weaver wheel alignment indicator; Weaver turning radius gauges; Herbrand workshop (small tools); Fairmont body tools; Binks spray gun; Black & Decker sander and polisher; "Blue Boy" one-ton hoist; Weaver floor jack; Chicago rivet and machine brake reliner; Standard Oil battery tester and charger; Blackhawk 10-ton porto-power; Weaver twin post lift; Aro lubricating equipment; and a Wilmington 15 cu. ft. air compressor. The equipment also includes a new Ford V–8 Engine. An "L" type, an overhead-valve type, and an airplane engine will be added as soon as one can be obtained.

The machine-shop equipment consists principally of the following: three 9-in. South Bend lathes; one 16-in. Monarch lathe; a 16-in. Queen City shaper; a No. 1 Kempsmith Universal milling machine; a 20-in. Buffalo drill press; a 6 by 6-in. Peerless power hack saw; a "Famco" arbor press; a Stanley pedestal grinder; and a ½-in. Black and Decker drill.

The forge and heat-treating equipment consists of a Stewart gas forge, anvils, and hand tools. An electric heat-treating furnace and a high-speed steel gas furnace will be added later.

The foundry equipment includes a large Fisher crucible-melting furnace capable of developing 3000 deg. F.; a smaller melting furnace for soft metals; Obermayer steel molding benches; flasks, and the like.

Facilities for instruction in welding include a 150-amp. Hobart portable arc welder and a set of "Airco" oxyacetylene welding and cutting torches.

The ceramic equipment includes the following: potter's wheel; a ball mill; electric kiln; a glaze spray booth with a Binks spray gun; and hand equipment.

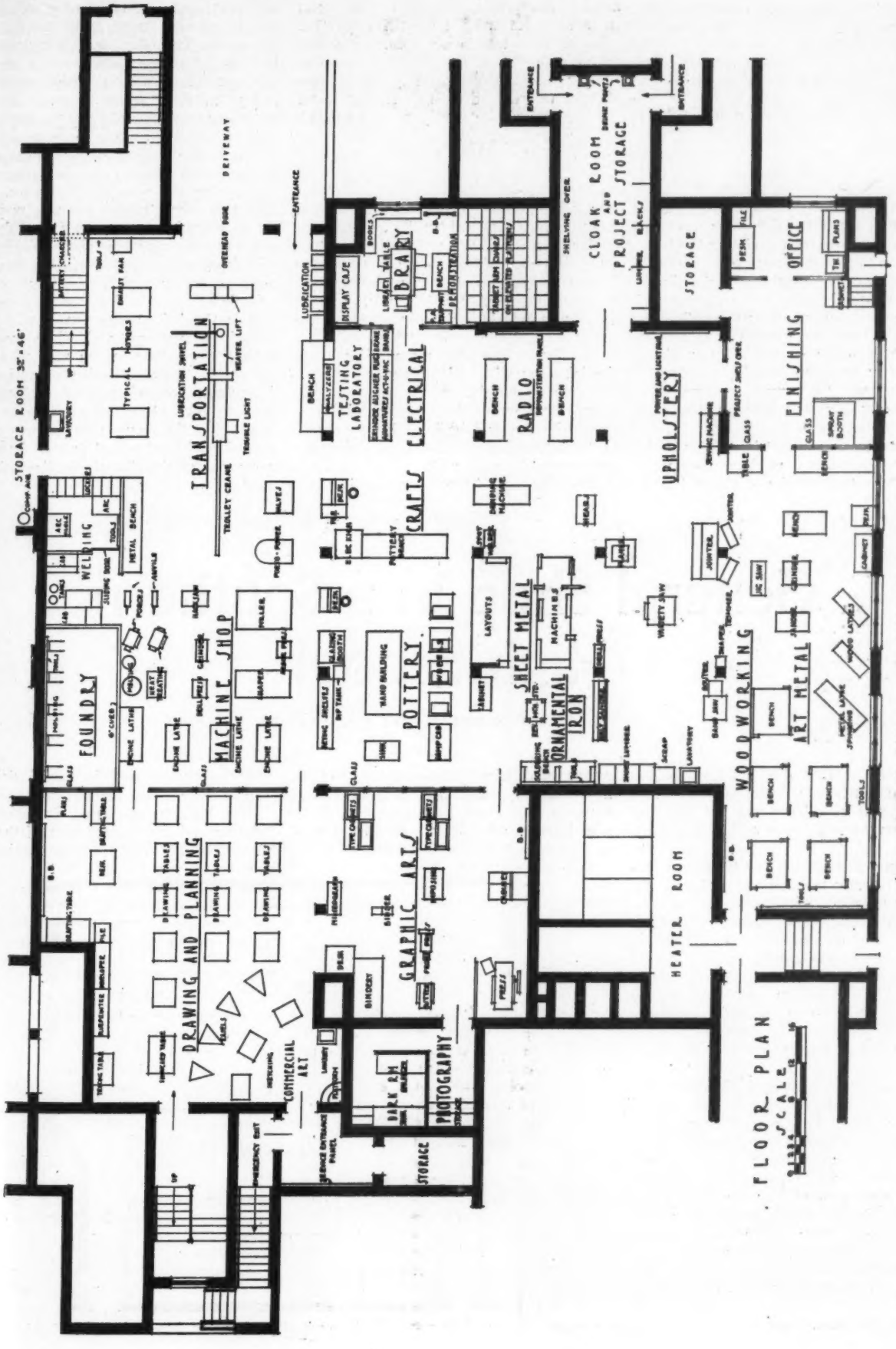
In the radio and electrical areas the students study power, light, and communication. Equipment includes motors; switches; transformers; meters; photronic cell; radio test equipment; parts for building radio sets, etc. A public-address system was recently built for the laboratory.

Equipment for sheet and art metal includes the following: 36-in. Niagara foot shears; 6-ft. Chicago bending brake; 30-in. Niagara bar folder; 30-in Niagara slip roll former; Niagara turning, wiring and burring machines; Niagara double seamer; Niagara setting-down machine; Pexto lever punch; Pexto crimping and beading machine; Niagara ring and circle shears; Johnson soldering furnaces; Dumore grinder and polisher; Metal Master jig shears; Metal Master spot welder; and a 14-in. Delta drill press.

Equipment for the woods area includes the following: a 36-in. Towsley band saw; a Yates-American variety saw table with mortising attachment; a 12-in. Oliver jointer; a 6-in. Gallmeyer and Livingston jointer; a 24-in. Fay and Egan planer; an Oliver trimmer; a Mummert-Dixon tool grinder; a Boice-Crane belt sander; a Skillsaw portable sander; a Porter-Cable spindle sander; a Delta scroll saw; a Carter shaper; a Carter router; Garden City blower and dust collecting equipment; two Yates-American 14-in. wood-turning lathes; one Oliver 12-in. combination wood-turning and metal-spinning lathe.

The finishing room is equipped with

*Public Schools, Cambridge, Ohio



Arts and Industries Laboratory, Cambridge, Ohio public schools

explosion-proof lights and switches. The 5-ft. Binks spray booth has an 18-in. ½ h.p. exhaust fan. The Binks spray gun is used for applying lacquers, enamels, and the like. Equipment also includes facilities for hand finishing.

The printing area equipment includes the following: a 12 by 18-in. Chandler and Price platen press; a 26-in. Challenge paper cutter; a Vandercook proof press; a Boston staple binder; an American imposing table; and two American type cabinets.

The photographic darkroom has a labyrinth entrance, thus obviating the need of a door and the possibility of having the door opened, thus damaging exposed photographic materials. Fumes are removed from the room by an exhaust fan. The 6-ft. sink is lined with sheet lead. Other equipment consists of safe lights; Eastman printer; Eastman auto-focus enlarger; timer Eastman "Recomar" camera (4.5 lens); Weston exposure meter; and Weston enlarger meter.

The drawing equipment is as follows: 15 Hamilton steel-wood mechanical-drawing tables; 20 sets Dietzgen drawing instruments; one large Hamilton steel-wood engineering drawing table with parallel rule attachment; a Pease 42-in. blue printing machine; a 42-in. Bruning B–W developer; an Ozalid developing tank; three Hamilton artist drawing stands; three Yankee artists easels; a show-card writer's table; a Paasche airbrush; and a Briscograph.

The lecture room is equipped with 28 tablet-arm auditorium seats, a demonstration bench, a portable blackboard, and facilities for projecting motion pictures.

The library, when complete, will contain some 600 or 700 volumes of interest to industrial-arts students, as well as magazines and other reference material. A large display case is built into one end of the room.

The large basement room adjacent to the laboratory is used for storage of supplies and materials, and for the assembly of large projects such as boats. A kiln for drying lumber will be built in one corner of the room. There is also, in this room, an automobile wash rack.

The capacity of the laboratory is about 100 per hour. The laboratory serves both the junior and senior high schools, about 525 in all. The junior high school students are routed through the various areas of the laboratory during which time they are given short *tryout* courses. This exploratory experience helps students and instructors to determine interests and aptitudes. If the student elects industrial arts in the senior high school, he is permitted to re-enter the area of his choice. From this point the students training may take on vocational aspects, with a possible three years of training in his chosen field before him, and with equipment that compares very favorably with that of many trade schools.

The Cambridge program is still in the experimental stage, and while much remains to be done in the way of *streamlining*, for more effective operation, the instructors are well pleased with progress to date. The 1100 visitors from 16 states have, for the most part, expressed approval, and local school patrons have been very generous and enthusiastic with their praise.

General Shop in a Southern High School

CECIL E. KING and CLAY EASTERLY*

The city of Bristol is located on the border line between historical southwest Virginia and east Tennessee. It has the distinction of being one of the few twin cities in the United States bearing the same name and having the boundary line running directly through the center of the business district.

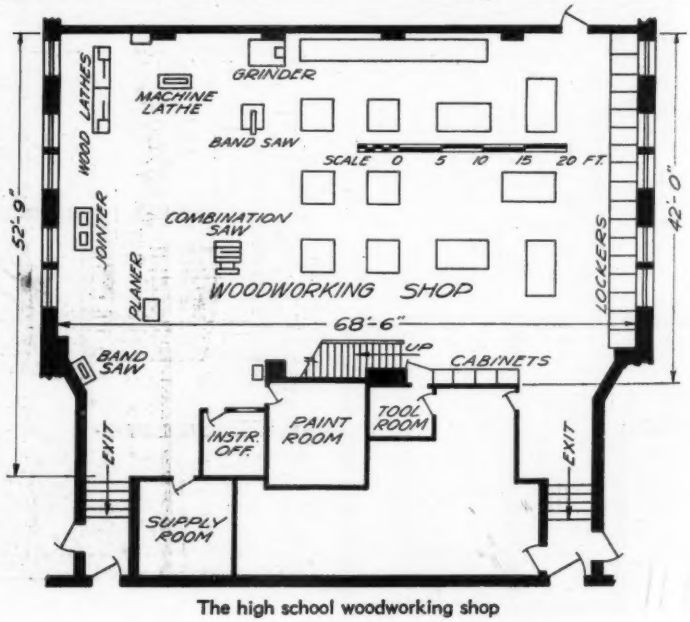
Bristol is essentially an industrial community and has among its industries: Bristol Door and Lumber Company, Bristol Builders and Supply Company, Columbia Paper Mill, Southern Railway Repair Shops, Norfolk and Western Railway Shops, Bristol Steel and Iron Works, Big Jack Overall Company, and several smaller concerns.

The educational policies of public education play a large part in the life of the community, and the program of industrial education has had a rapid growth finding a very important place in the school curriculum.

The boys who attend the high school have opportunity to try out in the fundamental fields; namely, general woodwork, sheet metal, electrical work, and mechanical drawing.

Just a few years ago the high schools were attended by only a selected few; the high schools prepared pupils for college entrance only, and, as a rule, only those who intended to follow a profession went to high school. Those who wished to enter the commercial and industrial fields received little or no thought or provision.

The high school courses are now organized around the environment of the pupil. In secondary education the fundamental



The high school woodworking shop

*Virginia High School, Bristol, Va.

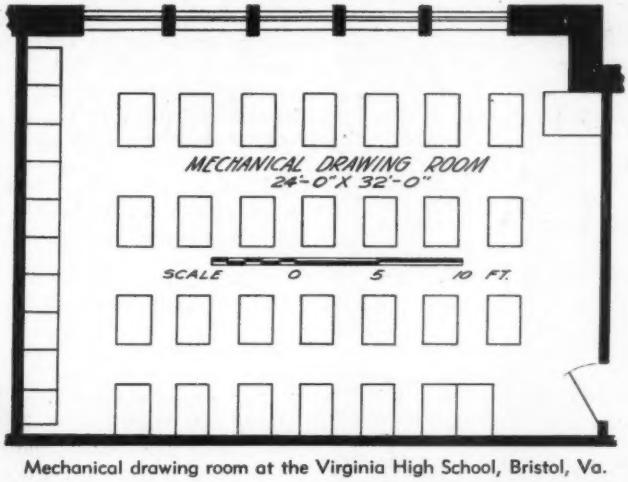
purpose is to enable the youth to understand and to deal effectively with his environment. While the school does not aim to turn out finished cabinetmakers or skilled electricians, it does endeavor to help those who study, to understand fundamental principles and to become the masters of their environment, for their own, and for the social good.

To enable youth to understand his environment, he studies industry, its products, materials, processes, and problems. At the Bristol Door and Lumber Co., for instance, the student sees the log as it enters the sawmill. There it is cut into lumber and drawn into the dry kiln. From the dry kiln it is taken and run through various machines cutting it into different sizes for particular kinds of work.

The question will be asked — Of what value would this be to a student? He not only learns the history of a board, but what it takes to produce a fine piece of work. He sees skilled workmen at their labors.

There is no end of miracles in a stick of wood, and whether the artisan who is working with it is a carpenter, a cabinetmaker, or any other kind of woodworker, makes little difference.

A view of the woodworking shop where the bench work is done



Mechanical drawing room at the Virginia High School, Bristol, Va.

Hundreds of students have portrayed their visions, ideas, and aspirations in competitive essays which were given to discover what youth thinks and wants. We know a great deal more about boys and girls than we did in the past. We know that through activity work the pupil learns the personal satisfaction which grows out of self-expression. The boy who can take elementary woodwork develops a creative effort. When he drags a board with wheels made of spools and says, "Choo choo"; and later makes a "scooter"; and still later a soapbox "automobile," with its exaggerated license plate, horn, and noise; and after that a "real racer"; he is merely fulfilling a growth essential to both individual and social progress.

In the new curriculum actual life situations must be part of the course if it is to be of value to the growing adolescent. To assist him there are charts on hardware, display boards on joints and nails, and blueprints giving information about various processes and materials used during the course.

In the woodworking shop he studies the different kinds of wood, hardware, the different processes of joinery, furniture repairing, and finishing.

The boy that enters the electrical course studies the fundamentals of electricity. He lays out and wires various types of circuits in a specially devised booth. Electric-iron cords are repaired. Electric toasters are fixed with new nichrome wire. He is taught to use good materials and to observe all safety precautions.

Metalworking is centered around the

The power equipment

In the new curriculum actual life situations must be part of the course if it is

history of metals and their uses. The student is taught how to construct simple projects that may be used in the kitchen. He learns how to make repairs on kitchen utensils. He learns how metal is produced, how to operate a machine lathe, how steel is tempered, and things of this nature.

The NYA boys have access to the shop to carry on their work. From the beginning of the NYA students have used the school shops and machines in the construction of school furniture. In their training they have found actual job experiences in repairing and finishing of furniture, mixing of paint, and painting. Alterations in the school plan, and the relocation of shops and equipment were also carried out by the students in order that this practical work might get them ready for the day that industry would be able to offer them jobs.

Industrial Arts at Portage High School

R. M. NASET*

The shop layout shown herewith pictures the industrial-arts department of the Portage High School, Portage, Wis. It is ideal for a one-man shop. The three rooms are on the northwest corner of the building on the ground floor. They receive plenty of sunlight at all times, without having glare at any time. The rooms are separated by glass partitions to enable the instructor to have complete supervision.

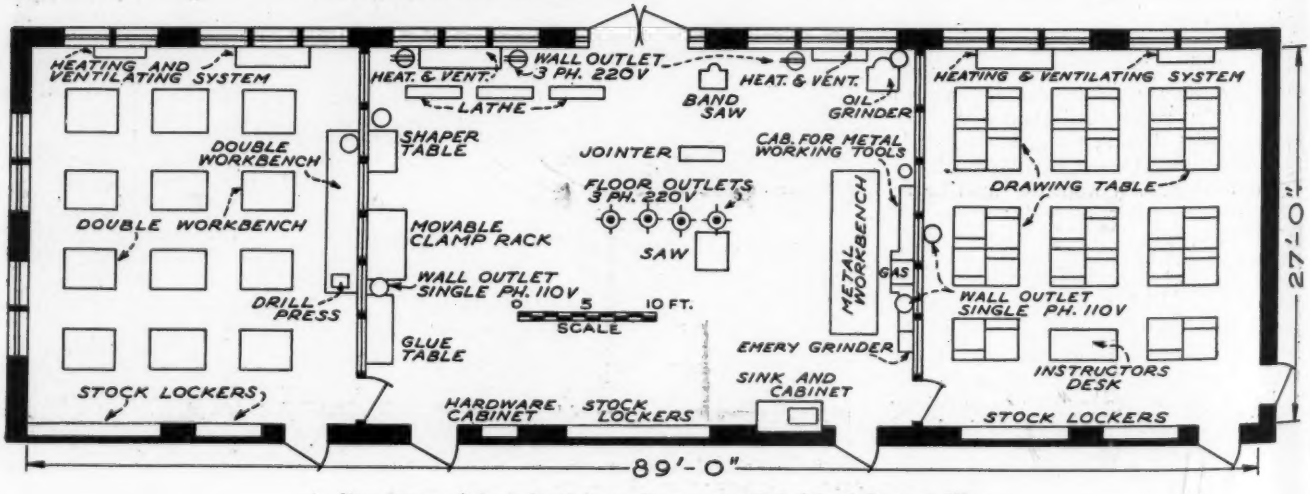
The drafting and planning center

The room to the extreme east is the drawing room equipped with individual tilt-top drawing tables. Each table has storage space for six drawing boards, instruments, triangles and T squares. The east wall is devoted to blackboard and bulletin-board space. In the south wall is a cabinet in which each student has space for his drawings, also a built-in bookcase and a storage cabinet. The room is used, when classes are in session in the shop rooms, as a shop library and for make-up work.

The bench room is at the west end. It is equipped with twelve double benches and one 12-ft. bench. Tools such as the drill press, miter box, sander bench, and portable router, are used on this long bench.

The center room is the largest where all machine work and project assembly is done. This room houses the following machines and equipment: three lathes (one

*High School, Portage, Wis.



Shop layout of the industrial arts department, High School, Portage, Wis.

A view of the power equipment in the wood shop

equipped for metal spinning), band saw, jointer, circular saw, oilstone grinder, emery grinder, shaper table, dovetail machine, portable router, one large metal-working table, wall cabinet for metal-working tools, clamp rack, glue table, gas plate, and sink.

The rooms have ample electrical outlets both 110 and 220 volts. All the stationary machines are equipped with three phase 220-volt motors while the portable machines are single-phase 110 volts.

The storage space in the shop is quite limited. However, there are 50 lockers built into the south wall of the machine and bench rooms. These take care of all stock 48 in. and shorter that the boys are using.

When the projects are assembled they are taken to the finishing room in the old building. This room was formerly the old shop. Because of its size all extra lumber and finished projects are stored here.

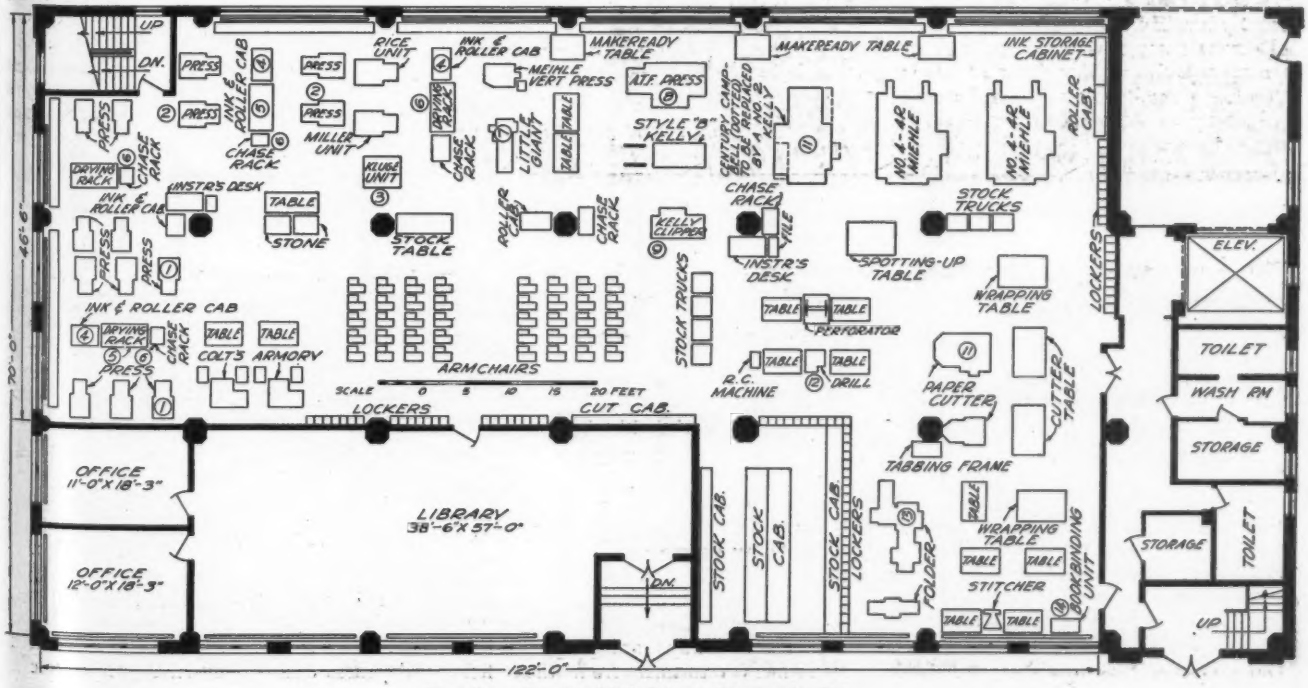
Printing High School at Cincinnati, Ohio

R. RANDOLPH KARCH*

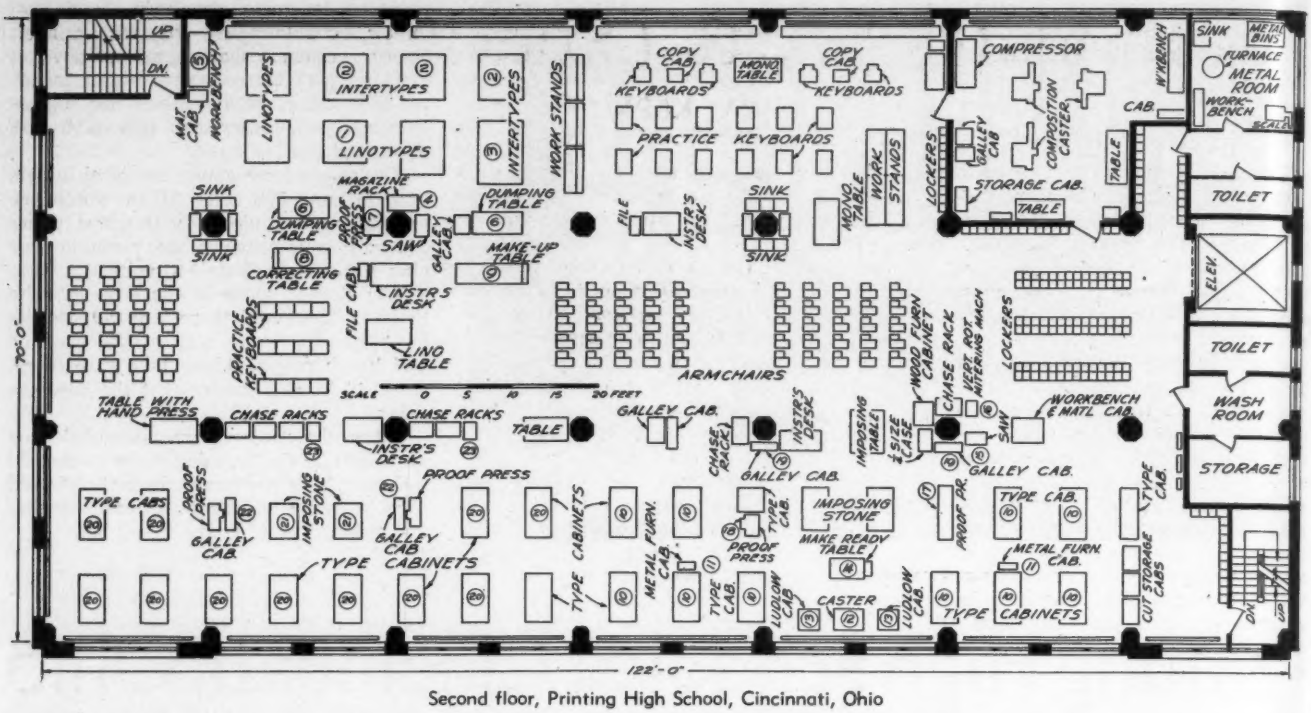
The Printing High School, at Cincinnati, Ohio, has the distinction of being an accredited senior high school of the first class, but entirely devoted to vocational printing and lithographic education. The day courses, in which students number 170, run for 48 weeks each year, for three years, and grant as much as 27 units of high school credit. The evening courses, which number as many students as the day courses, are devoted to the training of those men already engaged in printing and lithography.

*Principal, Printing High School, Cincinnati, Ohio.

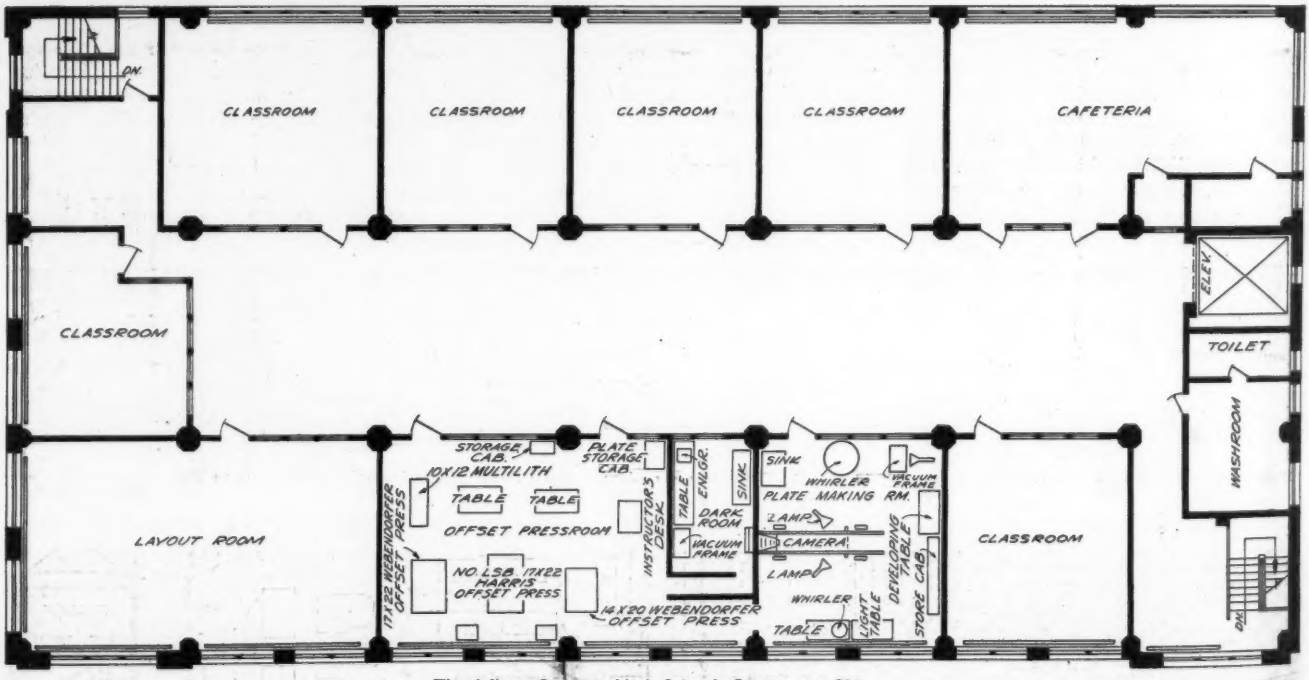
Housed in its own building, Printing High School is now going through a period of reorganization of equipment. The faculty consists of the principal and nine teachers on full time, and one on part time. The great majority of the equipment shown in the accompanying illustrations is already



First floor, Printing High School, Cincinnati, Ohio
Layouts by Randolph Karch and Milford M. Hamlin.
Tracings, courtesy of American Type Founders, Elizabeth, N. J.



Second floor, Printing High School, Cincinnati, Ohio



Third floor, Printing High School, Cincinnati, Ohio

in the school. Plans call for the reorganization to be completed during the summer of 1941.

Equipment items numbered in circles will be added as soon as possible.

SLOW DOWN AT SUNDOWN

Did you ever stop to think how much the half-light of approaching dusk increases your chances of being killed or injured in traffic?

Early darkness means that it comes during the rush hour — the peak time for traffic. Many people are going home from the office, workers are pouring from factories, women are homeward bound from an afternoon of shopping. In the rural areas the highways are frequently used by farmers returning from their fields, driving teams, tractors, or other farm machinery, many times with no warning lights.

When the above conditions are prevalent, do not follow the car ahead too closely. Always allow yourself a wide margin of safety for any mistakes and sudden decisions the fellow ahead of you may make.

Whether you are walking or driving, darkness means danger. More danger calls for more caution. It's just plain common sense to be more careful when you can't see as well — *Milwaukee Safetygram.*

An Industrial-Arts Experimental Shop

RAY KARNES*

The new industrial-arts experimental shop recently established in the industrial education department at the University of Missouri has several expressed functions as well as physical features that should be of interest to those engaged in either the secondary or the teacher-training levels of industrial arts.

This new shop, planned and equipped during the summer and early fall of 1940, was designed to serve three purposes: (1) provide facilities for laboratory work on an experimental basis for students enrolled in certain professional courses; (2) enable industrial-arts teachers attending summer school to supplement their undergraduate training by acquiring, under supervision, new activities which may be introduced into their high school programs; and (3) to serve as a laboratory in which regular undergraduate courses in general shop may be conducted.

*University of Missouri, Columbia, Mo.

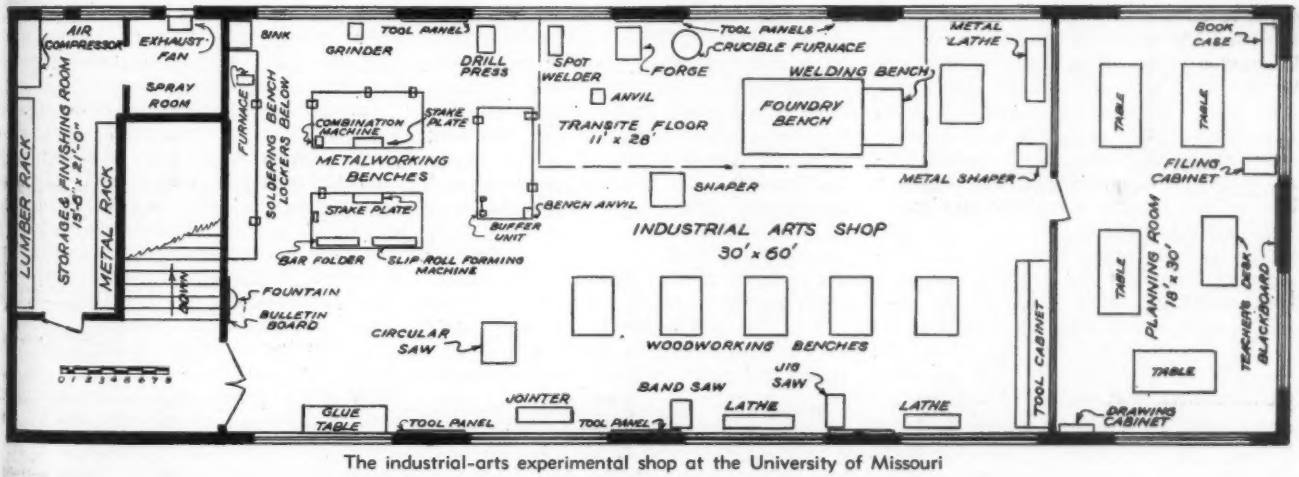
There has been an increasing need at the University of Missouri for facilities whereby students, who are enrolled in professional courses that consider the selection and organization of subject matter and the preparation of teaching materials, can try out, test, and revise their instruction plans before putting them to use in the public schools.

Just as in industry, the planning and designing phases of a new product are not considered complete until the model has been constructed, the product tested, changed and retested, the designing of a new project and the preparation of the teaching plan are not complete until the project has been executed and both the design and teaching plan either altered or confirmed. Planning and executing sample or core jobs within a given area of shopwork, enable the prospective teacher to anticipate more intelligently, the difficulties that may arise when he attempts to direct students within that area.

By providing a laboratory period in connection with these professional courses, an attempt is being made to test and evaluate work done in the courses. It is hoped that work done in the shop will bring about a more intelligent application and appreciation of theories developed during lecture sessions.

The second phase of experimentation for which the shop was designed is concerned with the study and manipulation of newly developed industrial materials to determine their possibilities as media for industrial-arts activities. In like manner, new tools and inexpensive pieces of equipment are to be investigated. Of course, such investigations regularly occur in many junior and senior high schools, but this activity should be encouraged also in the teacher-training institutions and should comprise a part of the training of industrial-arts teachers.

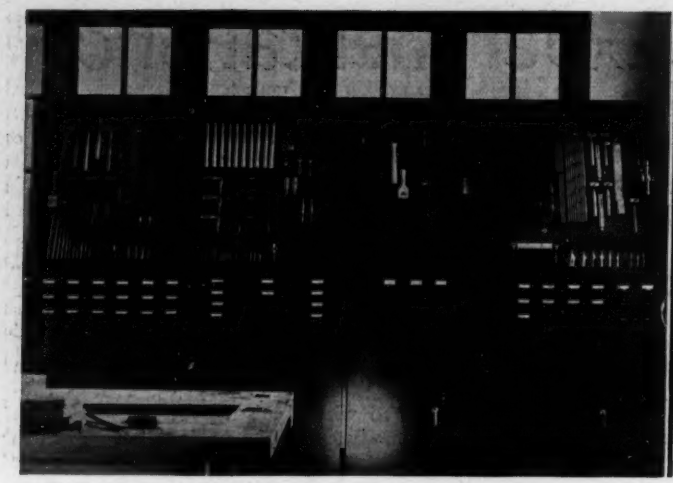
The second purpose for which the shop was designed grows out of the expressed



The industrial-arts experimental shop at the University of Missouri

View toward planning room

View toward planning room



Tool and storage cabinet

Example of tool panels

needs and desires of many industrial-arts teachers who attend summer school. Laboring under heavy teaching loads and additional school responsibilities, teachers experience difficulty in finding time to learn the information, acquire the skills and prepare the teaching materials necessary to introduce new activities into their industrial-arts programs. Many of these teachers have expressed a desire to spend at least a few hours while in summer school, learning new activities. Industrial-arts offerings have been so enriched during recent years that numbers of teachers deem it more profitable to spend several entire summers supplementing their undergraduate training with additional subject-matter courses than to pursue graduate studies.

In order to meet the needs of summer-school students who are desirous of learning new activities that can be used in their programs, the facilities of the shop will be made available during certain hours of the day. It is felt that by taking advantage of the library and planning facilities, materials, equipment and instruction at their disposal, additional activities can be mastered and teaching materials prepared readily with little loss of time.

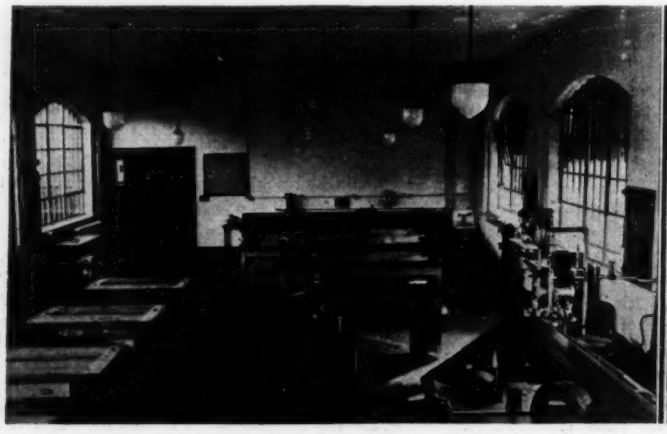
The shop is used also as a laboratory for conducting undergraduate general shop courses. Since it closely parallels the general plan of the type of shop recommended for the public schools of Missouri in the industrial-arts bulletin[1] recently released by the state curriculum revision committee, it is particularly well suited for teacher training in this state.

As is often the case in planning school shops, it was necessary to plan the experimental shop so as to conform to existing room arrangement. Utilizing the floor space available and without disturbing existing partitions, the shop was set up as shown. Inadequate locker and storage space and its extreme length are perhaps the most apparent disadvantages. In arranging the machines and tools, an effort was made to display tools in such a manner as to make them readily accessible to the areas in which they will be used. One design was used consistently in constructing tool panels and racks, enhancing to quite an extent, the general appearance of the shop.

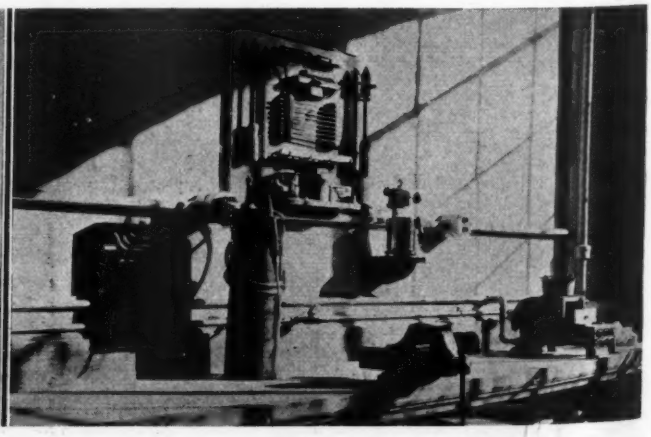
At a cost of approximately $5,000, exclusive of consumable supplies, reference and instructional materials and equipment were made available for conducting general shop courses that may include any combination of the following activities: bench and machine woodwork, upholstery, wood carving, art metal, forge practice, sheet metal, machine shop, ornamental iron, oxyacetylene welding, metal spinning, electricity, mechanical drawing, printing, plastics, and leathercraft.

One feature that is often recommended but seldom found in school shops is a planning area adequately equipped with reference materials. The diversity of offerings in the general shop makes it absolutely essential that an abundance of reference materials be made readily accessible to students. This fact, together with the peculiar functions of this shop, caused special emphasis to be given to the library and planning facilities. Because of this, every effort was made to procure an unusual array of published materials and to arrange them as an integral part of the shop equipment.

[1]Missouri State Department of Education, Curriculum Committee, *Industrial Arts Handbook*, 1941, Jefferson City, Mo.



View toward sheet metal area



Soldering equipment and soldering bench showing lockers below

Corner of planning room

Corner of sheet metal area, showing stake rack below table

A Rural High School Shop and Classroom

LOUIS M. ROEHL[1]

(*Reprinted by permission of* THE AMERICAN SCHOOL BOARD JOURNAL)

Many school systems desire an outside structure, apart from the regular school building, for shop and classroom work in vocational agriculture. Plan for such a building, 40 ft. by 90 ft. is presented.

It will be noted that the structure is built with 12-ft. side walls and with a quarter-pitch roof. Half of the building, the classroom end, is built with a second floor, the ceiling of the rooms of the first floor being 9 ft. This leaves room above to provide storage space for lumber, iron, and lockers for keeping the work being done by those in shop classes. These lockers may be inexpensive, wooden containers built by the carpenters. A depth of 2 ft., 6 in., and a width of 18 in. has been found suitable for the storage of work in the process of construction. In some instances the school administrators may feel that the storage facilities provided by the storage room on the first floor is ample. In that event the side walls of the building need be only 10 ft. high.

Since the course of shopwork recommended for a department of vocational agriculture includes the repairing of farm machinery, wagons, and tractors and the construction of large carpentry projects such as brooder houses, hog and poultry feeders, etc., a large door is necessary. Experience with doors varying in size reveals that one 12 ft. wide is better than those of narrower widths. The overhead door is better than any other for this place since it does not require floor space as do doors that swing in. It should be noted on the drawing that a common outside door is placed near the big door, the reason for which is obvious.

It is assumed that the floor of the shop is near ground level and a concrete or other paved approach to the door made so as to facilitate easy entrance to the shop with machinery.

As one recalls the arrangement of the local blacksmith shop, there was always a clear floor space in front of the big door and at one side a forge and an anvil. Near the forge was a blacksmith's post vise at a bench. Near by was a drill. Since the smith is no longer in service in many communities and it is more and more becoming the work of the individual farmer to do much of the work himself that was formerly done by the local smith, it seems to us sound school and shop management to see to it that the school shop is planned and equipped to make the same kind of work possible. And so in this plan two forges have been placed near the big door. A hand-power drill is fastened to the post near by. A motor-driven drill press is fastened to one other of the supporting posts of the shop. It is intended that each boy in a shop course have experience in drilling metal with a hand drill, chain drill, hand-driven post drill and a motor-driven post drill. He will thus become informed of the best investment for his own future needs. Several metalworking vises are at the bench near the forges, and a power-driven grinder is handy for all manner of work that may arise.

It may be noted that there are other metalworking vises fastened to a long workbench at one side of the shop for cold metalworking, soldering, harness repairing, and such other work as requires a metal vise.

One bench is suggested for the work in electricity. It is understood that a framework may be built for work in wiring and attaching fixtures at such place in the shop as may seem best to the man in charge.

Shop experience tells that more than one grinder is desirable in a well-planned shop. No skill is appreciated more by those who use tools than the ability to fit them. In communities where crosscut and circular saws are used to cut and buzz up wood for home use, one of the outstanding kinds of work that should be included in the shop course is the gumming and filing of crosscut and cordwood saws. For this work it is desirable that a grinder be fitted with a saw gummer and that it be left on the shaft for that work only. It will be noted that a saw gummer is located on a table attached to one of the supporting posts of the shop.

Two types of shopwork have been and are carried on successfully in evening classes by the out-of-school group. One is the repairing of farm machinery by the men, and the other is the repairing and refinishing of furniture by the women. The former requires no equipment other than that required for the regular shop courses of the high school students. The latter, however, calls for a wood lathe. Very frequently in furniture repairing a new part needs to be turned. It is for this reason in particular that a wood lathe is suggested. The wood lathe does not have enough use in the farming occupation to warrant high school students to learn its

[1]Professor, New York State College of Agriculture. Cornell University. Ithaca, N. Y.

operation for the farming industry other than as suggested.

Whether or not to include the metal lathe in the rural school shop is a question. One of the outstanding uses of a lathe is to turn down the commutators of the electric motors. In most communities where a community workshop is in operation this work might better be left to the men in that shop. Since the shop in a rural high school is planned and operated for those who have chosen the farming occupation, the metal lathe to them as farmers is of minor importance. A desirable place for the location is shown on the plan.

Since those in the farming occupation do not have sufficient use for a saw and a jointer to warrant buying them, it is held that our job as school administrators and teachers of shopwork is to see to it that boys in shop courses in a rural high school be taught how to do carpentry work with hand tools. After they have become somewhat skilled in the use of hand tools there may be a few who wish to learn their operation for home use. In placing the machines in the shop it will be noted that they are placed so there is room for long pieces to be run through in opposite direction and room at each side for those who operate them.

It will be noted that six double workbenches are placed in the shop. Experience tells us that benches 34 by 54 in. in size, equipped with two rapid-acting vises, are well suited for the work. To have them larger requires too much floor space and is not needed for such benchwork as should be included in the source.

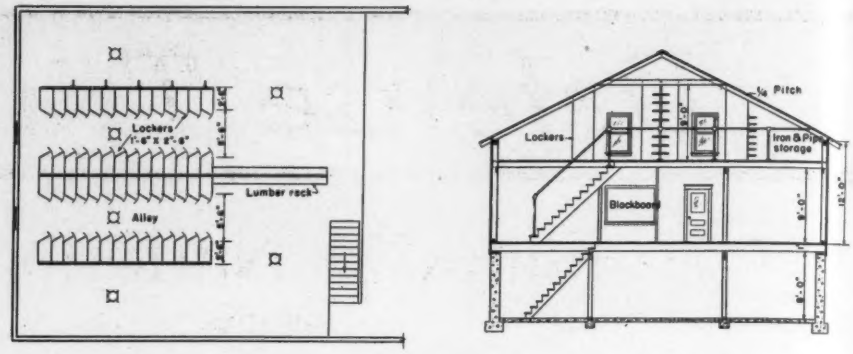
Tools for woodworking are kept in a cabinet on the wall of the shop in preference to having them in drawers at the benches. Location for this cabinet is on a wall of the office.

Tools for metalworking are handiest on the walls of the shop on racks, hooks, and inclined shelves where they are to be used.

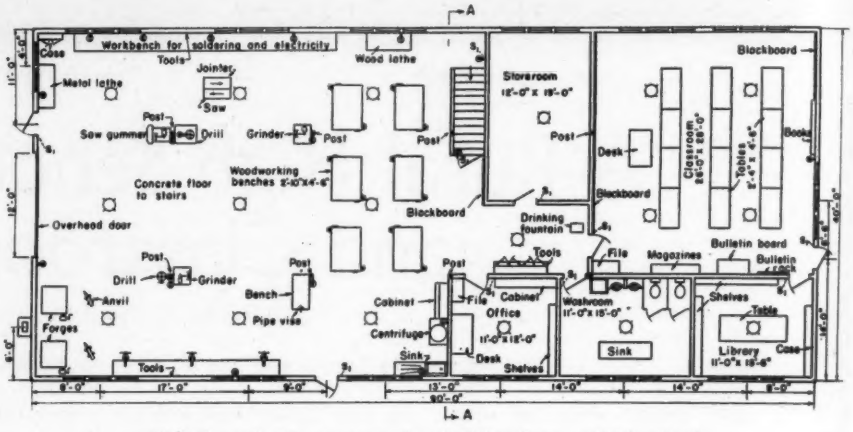
The corner of the shop next to the office is for the milk-testing equipment. This consists of a table for the centrifuge, a sink, and a storage cabinet. Teachers of agriculture prefer having this work in the shop rather than in the classroom.

A storage room is one of the outstanding needs of any well-planned building designed for work in agriculture and the shopwork relating to it. In the room herein planned it is left to the local teacher or school administrator to plan the interior of the room with cabinets and shelving as may be needed. A place for the storage of short pieces of lumber in an orderly way adds greatly to the orderly appearance of the shop. A cabinet for this use may be built in the storeroom.

One of the oustanding needs of the rural high school is a library where may be kept the literature that pertains to vocational agriculture and farm mechanics. Here is to be kept much of the advertising literature in farm machinery, pumps, water supply and waste disposal equipment, fencing, electricity and its application to home and farm needs, farm buildings, building materials, hardware, lumber, poultry requirements, and all other literature that is of interest and value to those whose interest is in rural life. Such a library is suggested in the plan. It is placed where noise of the shop is least disturbing.



Left: second floor plan of rural school shop. Right: cross section of building



First floor plan for separate shop building for rural high school

In communities where the library facilities are adequate, the library may be omitted, and the washroom, office, and milk-testing space may be moved toward the classroom end of the building. In that event, the space now used for the milk-testing work may be used to extend the shop facilites for laboratory equipment for the study of water supply and waste disposal.

A blackboard for the shop is placed on the wall of the storage room near the stair. This may be aided by the use of a movable blackboard if one is needed.

A drinking fountain is placed in the hall near the entrance to the classroom, thus making it readily accessible from all points of the building.

The room is planned for a class of 24 boys. Tables are 2 ft. 3 in., by 4 ft. 6 in., for two boys at a table.

It will be noted that windows are placed at two sides of the classroom. The front of the room and part of the back wall is equipped with blackboards. At one side of the room is placed the bulletin rack, magazine rack, bookshelf, and a file for records. A bookcase or shelving for books is suggested at the rear of the room.

The basement is excavated under the classroom half of the building and where a steam-heating plant is installed in the basement. The latest type of copper fin radiators are used and suspended from the ceiling with a blower back of each radiator to circulate the heat. Stairs leading to the basement are under the stair that leads to the storage loft.

A TEACHER

Is but a stepping stone
in the pathway of youth.
He may, like the stone
be rough and uncouth.
But broad and well based
for service to youth.

Or, the stones may be small,
poorly placed, far apart.
When youth stumbles by,
fast losing heart.
May we not wonder
Which stone, am I?

— W. E. Spangle,
Fair Oaks, Calif.

He is a wise man who does not grieve for the things which he has not, but rejoices for those which he has. — *Epictetus.*

Lay hold of today's task and you will not depend so much upon tomorrow's. — *Seneca.*

There are no free scholarships in the school of experience.

Defense Training

Training for National Defense

ROBERT W. TARBELL*

The nation has been called! Not with a fanfare of trumpets nor with savage cries of vengeance, but with a grim determination to defend our rights in a hectic world. To this task a democracy bends its energy.

Problems of national defense are much different now than when the embattled farmers rushed to Lexington and Bunker Hill. Within a generation war has changed to a highly mechanized combat. National security today calls for preparation far behind the lines, mechanics in many fields, men who can handle tools and equipment with speed and precision. The cry for skilled mechanics has gone up throughout the land. Huge war orders over the country have opened the eyes of the nation to the fact that we are short of skilled workmen. More than ten years of depression have thinned the ranks of mechanics. Today manufacturers are faced with an acute shortage.

Federal Training Plans

The national government has stepped into the picture. Realizing that factories cannot produce goods without skilled help, Uncle Sam has called upon the vocational schools of the country to train people for this emergency. It will be remembered that the CCC set up a training program several years ago. The national government instituted a plan for the young men enrolling under this act. The camps are still in operation, and these boys have not been forgotten.

The country is also quite familiar with the National Youth Administration. Broadly speaking, this movement was started to enable needy, meritorius young men and women to continue with their education. Jobs were provided for a few hours each month so that they might earn sufficient funds to defray the small expenses incident to schoolwork. This plan, the NYA, is still in operation. In the spring of 1940 the National Youth Administration received an appropriation from Congress to conduct a summer school program for these young men and women. Intensive training was given during the summer months in a number of vocations essential to national defense.

During the summer the defense training movement entered another phase. Inasmuch as the NYA program provided instruction for young people up to the age of 25 years only, thus excluding many thousands in the upper years, it was felt that a similar opportunity should be available for older people. Among the people on WPA are many skilled and semiskilled men. At one time they held jobs as journeymen or were machine operators. During the depression years they have been going from one odd job to another, with periods of unemployment between. Large numbers were eventually placed on WPA. Something was happening to those men during the years of uncertain employment. Just as a pianist must practice daily to maintain his level of proficiency, so must any workman keep in practice to retain his skill. While the fundamental principles of the trade will not be lost, yet some losses are sustained that mark the difference between the man still at work and the one unemployed. In the first place, there is loss of co-ordination. No man can be away from an occupation for an extended period of time without losing the fine touch, the trade sense, the precision and deftness necessary for successful work. Second, the world is moving on apace. Progress in trade practices is so rapid that a few years will show many changes. New machines, new methods, new demands are continually altering the workaday world. Third, upwards of a decade of unemployment for many men has added the same years to their age and sapped their endurance. Employers must necessarily consider the risk in hiring older people. All of these factors impinge upon a man in uncertain employment, producing a fourth loss. When a man loses his job and drifts about for some time, facing an uncertain future, he begins to lose his confidence. Bereft of his courage, he is afraid to try the work that was once so easy for him. With the odds against him he needs a period of retraining before going back to his old work. The Federal Government was aware of this situation and set up an appropriation to place some WPA employees in school. The plan was to retrain them for work at their former vocations. Realizing that the need was urgent, these men were to be given a short period of intensive training to refresh them. In fact, these courses were called pre-employment "refresher" courses. The program started during the month of July, 1940, merging as much as possible with the NYA schedule which was already under way.

Developments were taking place in rapid succession. The Office of Education at Washington, cooperating with other agencies, set up a plan to train people for this emergency. This new program was called the VE-ND, or Vocational Education for National Defense. This is sometimes referred to as Vocational Education of National Defense Workers. In order to conduct a training program on so vast a scale it is necessary to have plans well laid. Since uniformity is essential, the directions and regulations naturally emanate from the headquarters of VE-ND, at Washington. Space does not permit of a discussion of these regulations here. Suffice it to say that the expense involved in conducting these schools is being met quite largely from federal funds appropriated by Congress.

Who Shall Be Trained?

As indicated already, large numbers of WPA men are assigned to school on a project. It is merely a transfer from a former project to a school assignment. Their pay goes on as usual. The training period is about ten weeks in length and runs for thirty hours a week. At the end of this period of three hundred clock hours in school the trainee is referred to the public employment office with a rating of his accomplishments in school, or possibly to a private employer. The trainee also receives a certificate of his attendance at school and his accomplishment, which will be useful in securing employment. If he had skill at one time, he should be able to recapture enough of it in ten weeks of intensive training to be ready for employment. While in school this trainee is on a specific assignment. Since he is in for a refresher course, and since the time is short, he is assigned to a given process or machine. If it is bench molding or lathe operation or any specific job, he is to remain at that. The thought is that he is being prepared for a given place in industry and that there is no time for a broader program of training.

There are two kinds of students taking pre-employment refresher courses. The first, those on WPA, has just been described. Another group consists of those

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unemployed and listed with the public employment office. They are not on WPA. They attend school voluntarily, are not paid for it, but the school is reimbursed for some of the cost of instruction.

There is a third group of people, employed in some kind of work essential to national defense, who need additional training to round out their experience. These men may be registered in school in what are called "supplementary" classes. Thus, a man may be employed as a lathe hand and be registered in a class in machine blueprint reading. The school work aids him in his daily occupation and is supplementary. The student is not paid for attending these classes, but the school is reimbursed for some of the cost of instruction.

The Federal Government has not lost sight of NYA. Since these young people are getting ready for the world of work, they may choose the occupation they wish to enter. Their contacts with the school go on in much the same way as before.

Problems of Instruction

Leaving the above rather sketchy description of the setup, we now come to some of the problems of instruction. The vocational schools of the country were called upon to assume the job of doing this emergency training, and they accepted the job. These schools have been known for their flexibility. They can adapt their facilities to new situations with considerable speed and little disturbance. Let us discover how much different is the instructional job with this group than with other groups. Many of these men have been out of school for a long time. Their habits are rather well fixed. The disappointments of life have left some at the crossroads of doubt and disillusion. They may feel that this is just another project. Others are glad of the opportunity. The school faces the problem of taking these people, inducting them into the school atmosphere, diagnosing their cases, and assigning them to a course of training. It is unnecessary here to touch upon the purely psychological problems that arise in a situation of this kind. They are much like those found with other students of the same age and general background.

School Facilities

Providing facilities for training may put the school to the test. Since these men are to be prepared for defense industries, involving the operation of machines and equipment, it is necessary that they be given training in similar lines at school. In some localities this puts a severe strain on the equipment. Many school shops are already crowded. How to handle this extra load is a problem. The general plan is to set up classes in relays. These may be in the late afternoon or evening. They may extend far into the night. The natural distribution of time for a student attending thirty hours a week is six hours a day, five days a week. One plan is for classes to meet from 9 p.m., after the normal program of evening classes is over, until 3 a.m. Where the load is sufficient, a second shift may extend from 3 a.m. to 9 a.m. Such a plan and comparable plans are in operation at the Milwaukee Vocational School and other places. Equipment wears out more rapidly with extra usage. Supplies, fuel, current, upkeep — these are all problems that must be met. Appropriations from the National Congress include funds to reimburse schools for these expenditures. It is not the intention here to discuss the necessary paper work involved in such matters as induction, record keeping, expenditures, etc., but these are essential.

The Faculty

A special faculty may be required. Since the problems of instruction are different than for other groups of students, it is necessary to segregate the trainees. This means a separate group of teachers. Regulations from the office at Washington call for a minimum of seven years of practical experience at the trade or vocation which the instructor will teach. In normal times it would not be difficult to select a suitable staff of men to teach these classes. Many skilled mechanics would like to become teachers in their special fields. But in these days the supply of skilled mechanics is limited. Industries are also seeking them. Vocational schools have had to compete with the industries in the matter of selecting skilled help. Very few of these men are experienced teachers. The school, then, has the problem of teacher training along with the other administrative problems incident to the VE-ND program.

There are problems of instruction calling for special treatment. Quite naturally the school will keep records, will discuss student progress with teachers, and will make recommendations for extension or termination of training programs for trainees. The Washington office has designated the school as the agency which shall determine whether a student can profit by training. The school may also recommend a short extension beyond the ten weeks set up for WPA trainees. The period may be shorter. The instructor is the main person who will determine when the student is ready for employment.

It would be interesting to cite case studies as illustrative examples, but the movement is still very new, and more data should be collected before drawing any conclusions. The program itself is still in the developmental stage. New steps are being inaugurated from time to time. It seems certain that the Federal Government is thoroughly in earnest in its plan to train for national defense.

THINGS TO THINK ABOUT

R. W. Selvidge,

University of Missouri,
Columbia, Mo.

Pride in workmanship should be cultivated not only because of the satisfaction it gives the worker but because there is no surer foundation of good citizenship.

We like to do the things we do well rather than do well the things we like to do. A task which is distasteful in the learning may be a matter of great pride in accomplishment.

Students usually are not greatly interested in positive efforts directed toward the development of character traits; nor are they ordinarily interested in the acquisition of skills or information except as they can be used for immediate satisfactions.

Our secondary schools have been criticized for giving most of their attention to the preparation for college when a majority of our students do not attend college. So the vocational education program may be criticized for giving a major portion of attention to the highly skilled trades when a vast majority of the industrial workers are not skilled craftsmen and learn their vocation in a few weeks or months. An adequate vocational education program must be based upon a scheme which will give proper training to the workers in all branches of industry. The problem cannot be solved by training the workers in a few of the more highly skilled vocations.

A sail boat built in the woodworking class, at the E. D. Libbey High School, Toledo, Ohio.
F. J. Vogler, Instructor

Industrial Arts in the Defense Program

FRED C. FINSTERBACH*

It appears that before much can be said about the relationship which should exist between the industrial arts and the National Defense Program, some time should be given to an explanation of the program itself.

We have been warned again and again of the critical situation which exists in our country. If we are at all willing to accept the opinion of those who ought to know, we are as poorly prepared for war as we are nearly involved in war.

To anyone who scans the daily news with any thought at all, these three facts must be apparent:

1. Our national sympathies for the most part are with the British people.

2. We are very close to actual involvement, even though we fully realize the bitterness and misery which war inevitably brings.

3. We are poorly prepared for modern warfare.

We all know, too, that no one ever picks on the biggest kid in the neighborhood, unless that kid is so fat and overstuffed, and out of shape as to make "easy pickings" for anyone. Our nation is just waking up to the fact that its position is similar to the fat boy just described. It has only yesterday decided to lay down its ice-cream cones, and its candy bags to get in shape, not for battle, but to defend its peace. Until yesterday though, we have held our fingers crossed, closed our eyes and made a wish. Some are still doing it!

It is gratifying that our educational institutions are not among them. Early last summer vocational schools throughout the state and nation put themselves into high gear to supply the call for workers which came from the defense industries. The speed with which they performed was little short of miraculous and industry has been quick to commend this.

Thousands of workers have been trained for key industries and already the cream of urban employables has been skimmed. According to all indications, there is a definite need to have from 25 to 50 thousand semiskilled and skilled workers available by January, 1941. The New York State Bureau of Industrial and Technical education has embarked upon a program of training to augment the work being done by the cities. The centers which it is establishing will draw on the entire state for trainees for defense industries. While the greatest immediate demand is for aircraft workers, there is a great demand for machinists, tool workers, lens grinders, welders, and hundreds of others needless to list here at this time.

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The question may be asked, "What has all this to do with industrial arts? This matter affects only the vocational field! Industrial arts is general education, not vocational; therefore, the defense program is not directly our concern!"

The defense program, however, should be the concern of all educators. Physical preparedness is only one part of the picture. The other part is moral preparedness. A gun in the hand is not a substitute for a stiff backbone. We need in this country, more than ever before, minds and hearts attuned to keep pace with the productive genius at our command. We need patriotism instead of paternalism, backbone instead of wishbones.

This is the task which confronts all education. The immediate implication for the industrial-arts field is to make increased use of its laboratories in a supreme effort to instill the spirit of enterprise, of hard work, of self-sacrifice into the hearts of all students with whom contact is made. To intensify its guidance efforts, to discover more quickly aptitudes and special abilities. To develop these special abilities and direct the student toward a program which will make use of these abilities. To place increased emphasis upon the acquisition of some degree, skill in work of a more necessary industrial nature; to stress economy in the use of regular materials during the ensuing years.

The necessity for national defense has focused the attentions of the public upon the need for skilled workers. Even a hurried trip through one of our airplane plants would intensify this feeling. To some extent the type of diversified experience offered in industrial arts comes closer to fulfillment of demands than some of the old line vocational subjects.

In a recent visit to an airplane plant in connection with my particular part of the defense program, it was a revelation to see a whole department devoted to the making of plaster of Paris patterns. Another engaged in the casting of zinc and lead dies, others working at the shaping of flat metal by stretching and shrinking with hammers; more in the making of tools or in redressing and heat treating. All of these, and other activities have formed part of the progressive industrial-arts education in the past. The nature of the aircraft industry is such that the individual worker handles a greater variety of tools, materials, jigs, and machines than are ordinarily found in vocational schools. The diversified program of industrial arts as set up in this State has anticipated correctly the nature of this demand and is in an important position to complement the more intensified vocational setup. Given a little more time, particularly in the senior high school, industrial arts could make a direct contribution to the defense program.

In New York State, ten centers for the training of aircraft riveters, sheet-metal fabricators, and subassembly workers will soon be opened. Forty teachers for these centers have just finished a course in training at Buffalo and are already assigned to their posts.

Each of these centers at Olean, Elmira, Syracuse, Utica, Plattsburg, Glens Falls, Yonkers, Lynbrook, Freeport, and Bay Shore will all need help in tooling up. The State has had difficulty in obtaining lathes and machine equipment. Many small tools necessary for riveting, fabrication, and assembly have to be made up on the job.

If you have a lathe in your industrial-arts shop you can assist by volunteering to make needed rivet sets, and the like. Instead of letting your pupils forge cold chisels, let them make tool-steel bucking bars for the defense training shops. Find out some of the simpler dies needed for fabrication!

Can there be any stronger motivation for your work than defense of country? Will your boys work harder on a decorative pin or an ash tray than on a tool for defense training?

Will you develop accuracy, appreciation of materials, thoroughness, or any other desirable habits any the less if your students bend their efforts toward this goal?

Granted that the industrial-arts aims are general; granted that these classes cannot develop the fine degree of skill demanded of strictly vocational training, it is now more important than ever before that this work become an integral part of everyone's education. And while we are at it, why not objectify this work toward defense of our country.

The lofty idealism of the "more abundant life," "education for leisure," and other aesthetical aspirations might never be possible unless we keep our feet on the ground and weights in our pockets in the shape of practical attempts to meet the conditions of life which are changing so rapidly.

The present struggle is more than a conflict between democracy and Nazism. It is more than a war between governments. It is, in the final analysis, a conflict between restricted and free thinking. As much as we believe in democracy, as much as we will fight for its preservation, we cannot ignore that the other side is playing for keeps, and that their beliefs are just as strong as ours. What is more, they are persistent and possess great ingenuity, inventiveness, and engineering skill and knowledge.

We in America have the productive enterprise. There are probably more lathes in

the city of Detroit alone, than there are in the whole of Germany. While Europe has had to standardize on a few models of planes, we have been free to experiment. We have performance records for our planes far superior than that of other countries. Our system of free enterprise and healthy competition has produced planes possessing more maneuverability, greater speed, and more effective armament, than those emanating from the subsidized industry of Europe.

If we can get skilled labor fast enough we can build any number of planes, ships, tanks, guns, and other pieces of military equipment. We can increase our raw material output almost overnight. When we want twice the amount of ore, all we need to do is to put more steam shovels to work. Our bottleneck is in getting skilled workers to build and man the blast furnaces, the lathes, and the shipyards which the ore makes possible.

Moving another man in for doubled production is not so easy. The human brain has to be trained. We can't take an untrained man and overnight make him a mechanic. The judgments, the feelings, the eyesight, the thoughts demanded of a mechanic call for a wearing-in process. Wishing won't make it so. Training will!

No part of our people can remain idle, no division of education remain aloof. There can be no rest for anyone if we hope to retain what we have, to think as we do, to be what we want to be.

We cannot afford to treat this matter or rearmament lightly. Hitler has demonstrated the folly of unpreparedness to the world at large. Armaments will not be discarded so quickly after *this* war is ended.

The war is causing other changes too, which will be far-reaching in their effects. The demolition of the midlands of England will not be altogether in vain. From it will spring a rebuilding, a redesigning, an evolution in city layout, in industrial organization which probably would have taken centuries to develop otherwise.

Defense industry implies more than the making of bullets, tanks, and airplanes. It means modification of housing, extension of subways, bombproofing of buildings, revamping of transportation, roadways, utility services, and increased sanitary facilities.

Moreover, defense industry will demand the concentrated effort of everyone.

America is not about to engage in a fencing bout with windmills. Real facts must be faced.

Industrial arts as such has long struggled for separate identity. A national association devoted to the promulgation of this idea has been developed. Separate identity is less important now, however, than concerted effort. Complete uncontested divorce from vocational education in this state seems impossible, even if it were desirable. However, industrial arts need take no back seat. It can sit with the driver and help operate the controls — both are headed in the same direction anyway! General education, vocational education, any real education will cease to exist if we fail in our attempt to rearm the nation and to do it quickly.

Training for National Defense in Florida

MAUDE G. WOODS*

Florida saw, long before the coming of the present defense training emergency, that famous old handwriting on the wall. She realized that the dearth of skilled mechanics, the result of lowered demands during the depression years, boded ill for industry when the upturn did come. Roger Babson's "fundamental law of action and reaction that causes the business world to travel in regular cycles of prosperity, decline, depression, and improvement" was pointing strongly toward a period of improvement. Florida knew that additional opportunity must be furnished her youth to obtain vocational training, for of evidence there was abundance that today's youth in this state was turning to trade and industry, not to the professions, for its livelihood.

The state department of education, under a farsighted educational leader, Dr. Colin English, had been surveying the situation for four years and had been taking note of industrial growth and increased industrial possibilities which would shortly call for a greatly augmented trained personnel. Florida would need the workers; the workers needed the training.

Tourists Not All of Industry

Tampa's shipyards were growing in volume and importance, and Eastern Airlines and Pan American Airways in Miami were expanding their facilities. There was every indication that Florida might, because of her closeness to South America, soon become the logical center of a thriving commercial air business between the Americas, which would call for more and more mechanics, repair-, and maintenance men.

Into Jacksonville had come pulp and paper mills, as well as into Panama City, Port St. Joe, and Fernandina. This meant increased building construction throughout the area, which was quickly reflected in the lumber industry over the state and in the building trades.

Roosevelt Hotel, Miami, Fla., which is being converted into a trade school and which on completion will be valued at a million and a half dollars, exclusive of equipment

The tung oil industry in Florida was developing to sizable proportions. The turpentine and rosin factories were doing a thriving trade. Limestone quarrying, lime products and cement manufacturing, phosphate and kaolin mining, box and crate manufacturing were all assuming importance — and the tourist business was becoming more and more a business to be reckoned with. Hotels were going up on every side, and apartment houses, and homes, and restaurants.

Florida had for a score of years had her naval air station at Pensacola, and this station was increasing in size and importance: the not too distant rumble of war had reached attentive ears. More men should be offered vocational training in Pensacola, civilian employees who would be needed at the naval air station the moment expansion began in earnest. To provide this training, more space was needed. The existing vocational school was already overcrowded, and evening trade extension classes were overflowing.

All of these indications pointed to just one "must": adequate vocational training facilities, larger buildings, more and newer equipment, the best possible instructors, not in just one section of the state, but in all sections.

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Federal funds pay for teaching personnel, but not for buildings and equipment for vocational training. The problem then was clear: to encourage local communities, the local school boards, administrators, advisory committees, and budget commissions to concentrate on the imperative need of providing adequate training opportunities, of building and equipping schools against the demand which was inevitably coming.

Florida Keeps in Step with New Trade Schools

There has always to be a psychological moment for crystallizing thoughts into action, and when Florida was faced with the defense training emergency in June, 1940, she realized that the psychological moment for expansion had arrived. Florida realized, too, that the emergency was temporary but that her youth's needs were not, so she planned her expansion most carefully to the end that her new trade schools would be erected in locations where industry showed signs of greatest future growth.

However, Miami educators saw the light before the emergency arose, and for three years they had been working without cessation to acquire a building to house a trade school commensurate with Dade County's requirements and possibilities.

A state is fortunate whose county superintendents and board of education are in sympathy with vocational education. Florida is fortunate in this respect. In Dade County, the superintendent of schools, Mr. James T. Wilson, the board of education, and the newspapers have worked untiringly to further the cause of vocational education; and it was largely through their efforts, in appreciation of the outstanding achievements of P. W. Seagren, principal of Miami Technical Hign School, and Charles R. Hale, director of evening trade extension education in Dade County, that Miami has obtained her new building for a trade school. The 14-story unfinished Hotel Roosevelt, valued at $1,000,000 and situated in an ideal position for a trade school, was purchased for this purpose. The building is being renovated and finished inside for vocational school use, and when completed in the spring of 1941, some five or six hundred thousand dollars, exclusive of equipment, will have been spent in renovation and reorganization of the structure. Miami and Dade County will be ready then, with one of the finest technical schools in the South, to train youth to fill every demand in South Florida.

Duval County, of which Jacksonville is the county seat, has been equally fortunate in having local school authorities who realize the need for greater vocational training opportunities. Today Jacksonville is ready to begin work on a $600,000 building layout, and by another school year, Jacksonville will be ready to train young men for trades which are essential to the operation of the southeastern air base, as well as for civilian pursuits.

Pensacola also has realized her ambition to expand, and in November ground was broken for the construction of a $300,000 trade school, which will be completed in the spring of 1941. This building will house completely equipped shops for teaching courses in auto mechanics, internal combustion engines, sheet metal work, gas and electric welding, electricity and radio, drafting, aerodynamics, carburetor repair, coppersmithing — and it will include a cafeteria where restaurant and service cooks will be trained. Pensacola will be able to meet all her demands for training, in both day trade and evening trade extension courses, not only for mechanics employed at the naval air station but also for those desiring to enter private industry in northwest Florida.

West Palm Beach voted bonds to build a new trade school which will offer a complete training program in aeronautics, with an approved A. and E. School, in addition to a number of other skilled trades.

Tallahassee is completing plans for a new technical high school which will offer training in airplane engines and several other allied trades.

Schools See Defense Training As Opportunity

Practically all of the trade schools in Florida were closed for the summer when, on June 27, 1940, President Roosevelt signed the Act of Congress appropriating $15,000,000 for national defense training in the vocational schools of the United States. The state department of education, through the state board for vocational education, called all county directors of vocational education together on July 1 and planned for immediate reopening of trade schools in localities where there was demand for trained men in industries essential to or allied to the national defense. The challenge was accepted with enthusiasm by both administrators and teachers — vacations, summer employment, summer school activities notwithstanding.

On July 15, two weeks after passage of the defense training act, the vocational schools in Florida threw open their doors to carefully selected men who qualified for refresher training courses, and in eight weeks' time they were placing mechanics in private industry and looking for more men to train, more places in which to train them. They used every available teacher, every available inch of space, and still the calls from industry and from prospective students. On September 1, when the public schools reopened and youth came clamoring in greater numbers than ever before for trade training, it was found that vocational schools must be put on a 24-hour operating basis: defense classes from ten o'clock at night until six in the morning; day trade classes from eight until four daily; evening trade extension from six o'clock in the evening until ten o'clock at night. Such was the public school morale that no conflict has occurred in operation of the triple program.

Florida began her defense training program with an enrollment of 897 men in pre-employment refresher courses: courses designed for previously trained and experienced men who needed only a few weeks of intensive retraining to brush up their old skills and to learn newer methods before entering private employment. But a heavy demand for supplementary courses — conducted at the close of the working day for men employed in occupations essential to or related to the national defense — soon began to make itself felt; and at the present time over 1500 men are being

Supplementary class in aircraft motor overhaul, offered for civilian employees at Naval Air Station, Pensacola, through Pensacola Trade School, as part of the Defense Training Program

given instruction in new developments within their occupational fields or in certain occupations closely allied to the trade in which they are working. For instance, a number of first class automobile mechanics are taking supplementary courses in airplane engine work, so that in the event it is necessary for them to change over from work on automobile motors to work on airplane engines, they can make the change without material loss of time or efficiency.

At Jacksonville, a cooperative arrangement with the naval air station has just been completed whereby the regular staff of instructors in their $3,000,000 trade school for enlisted men is being supplemented with instructors supplied by the state department, to handle some 3000 enlisted men who will be going through its various schools every 16 weeks: airplane handling schools, airplane engine schools, machinist's mate schools, welding schools, fabrication schools, instrument schools, carburetion schools, and testing schools. Within the next two months, 34 teachers will be engaged in the training schools at the Jacksonville air base, which is one of the three schools of this particular kind in the United States.

At Camp Blanding, where 23,000 men are working day and night to complete an army post that will have capacity for handling some 75,000 troops, supplementary courses are being offered for these workmen after their working hours which will help increase their efficiency on the job and their desirability as employees, thus increasing the return on money paid them in wages.

At the request of commanding officers, the state department of education is offering to officers, enlisted men, and workers on this and other bases courses in Spanish, as there is more than a probability that numbers of these men will shortly be coming in contact with our Caribbean and South American neighbors, and this second language will add to their efficiency on the job.

Defense Training Pays Dividends in Better Morale

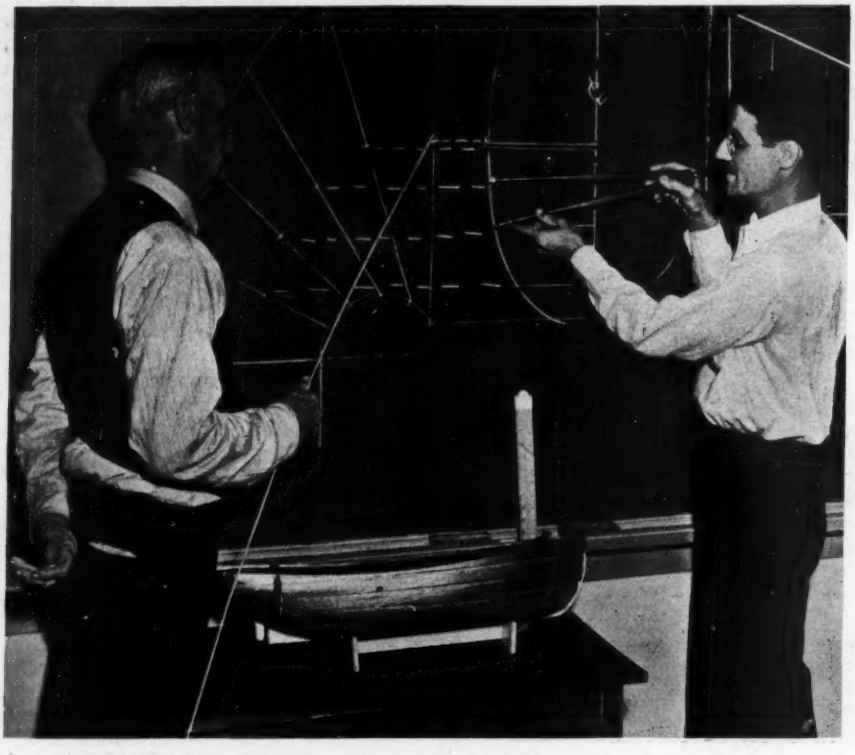
Nearly 100 per cent of the men trained in Florida in refresher courses were chosen from the WPA rolls, many of them once excellent mechanics who were forced out of their trades early in the depression years and who had, through necessity, been hanging on to the temporary security of WPA. Through the foresight of Commissioner John W. Studebaker of the United States Office of Education, departments of vocational education of the various states have been able to reclaim this valuable man power. Florida naturally had been a mecca for these experienced but unemployed men for the past several years, and she was fortunate in the quality of craftsmen whom she found ready for rapid retraining.

It is impossible to measure by monetary standards the value of this reclamation of human resources. Figures show that the 500 men placed thus far in private industry as a result of refresher training are earning between $140 and $240 a month — some as much as $300 and $340 a month — as compared with the former $53 average monthly wage on WPA pay rolls, and the earnings for these men for a year approximate $925,000. These 500 men are turning back to Florida WPA $318,000, the amount they were receiving annually from WPA before the national defense training program made it possible for them to find private employment. The state is feeling the beneficial results of increased private pay rolls, increased spending, increased tax returns.

But the new light in the eyes of these men, the new spring in their step, their renewed confidence in their own ability — to say nothing of the feelings of release and pride on the part of these men's families — is still another aspect, which defies evaluation.

Florida will continue to have a place for these men and the scores of others that she is placing and training for placement, when the emergency is over, for employers say that some of the best talent and the greatest productivity are found in this group in the 40 to 55 age brackets. The retrained man who has been given his second chance at private employment is taking supplementary courses after working hours, so that he may have more than one string to his bow when adjustments are made at the end of the period of present emergency. He is looking in many instances toward commercial aviation, knowing that Florida is counting on a natural expansion in commercial aviation, knowing that the ground crew for any given air field outnumbers the pilots ten to one; and knowing further that Florida will be keeping her naval air stations in full operation for some years to come — which means that there will be room for every skilled mechanic for the remainder of his productive lifetime.

In future years Florida will be able to train and maintain the necessary reserve of skilled workmen without haste, crowding, and improvisation. She will have the space and the equipment to offer to boys and men selected for their ability the two-, three-, and four-year courses which they may desire to fit them for entry into private industry in the occupations of their choice. She may have further expansion, further building and equipping to do before many years — she hopes so — but Florida's educators are happy in the realization that her citizens are cooperating wholeheartedly in support of public vocational education.



Mold loft layout, Brewster Vocational School, Tampa, Fla. F. J. Christ, instructor. (National Defense training class)

The secret of happiness is not in doing what one likes but in liking what one has to do. — *James M. Barrie.*

What I must do is all that concerns me, not what people think. — *Ralph Waldo Emerson.*

The first and most important step toward improvement is the decision to improve.

National Defense Training Objectives

EARL M. BOWLER*

At least two grave dangers lie ahead in training workers for national defense occupations. Industrial-arts men have faced the two-horned dilemma and are at the present time hung very high on the generous side. When it was discovered in the industrial-arts field that the half dozen objectives could be expanded, *ad infinitum*, scholars and teachers alike began a wholesale expansion program the end of which we have not yet seen.

In defense training there seems to be a lack of unanimity as to what really are the goals of attainment. Is it not true that the paucity of specific objectives prepared on a national scale has permitted the program to seesaw without really cutting wood? If you have at hand the objectives for the program in your community do you know whether or not they dovetail into a unified whole plan that will ultimately permit the attainment of specific quantities of production on a national scale? After all, this is not a battle of states; it is a fight for freedom of the democratic processes. Democracy must function articulately this time or it may not function again.

No sooner will it be discovered that we have been groping our way along an unmarked road without landmarks, than we will find that a multitude of objectives have been set up. We will find whole sets of objectives toward which we are supposed to move. Guarding against the dilemma which has entrapped our industrial-arts friends is important. Expanding our objectives to the point where they are like grandmother's dressing sacks, covering everything but touching nothing, is as dangerous as failure to establish objectives.

We must choose between no objectives (as now), and too many objectives (at some future time). There is a need for a few clear objectives which delimit the ends toward which we are working in defense training.

Our problem is much like that of teaching a person to shoot at a target. We can step off the distance at which to stand; we can specify the gun to be used; and we can include the ammunition and target size. An analysis later of the trainee's faults and the desire to correct them on his part should give us a skilled marksman within the limits of the individual's capacity. Such training should lead to a skilled finished product. When repeated elsewhere often enough, such training should lead to hundreds and thousands of skilled marksmen. The only variable under controlled conditions would be the capacity of the trainee.

In general, then, we can start with specific objectives in our training program; we can select good material to train; we can present the training in a lifelike manner; and, we can obtain a usable product as an end result. Multiply the training opportunity and you multiply the end results.

Contrast the cases defined in the foregoing with that of making our objectives all inclusive. In an attempt to justify our industrial-arts programs haven't we moved the target closer and closer? Haven't we expanded our objectives in certain fields until we now say, "It is preparation for life"? What in our experience isn't "preparation for life"?

By moving the target closer (making our objectives more and more all inclusive) are we not destroying the justification for our work by destroying the individual's opportunity to attain tangible results in a lifelike competitive situation? Through the generalization of our objectives we have weakened the justification for our program in the eyes of the paying public. Definitely, end results of myriads of shadings based on the same fundamental fact are easier of attainment than end results of the basic fact itself. Moving the target closer does not make the situation more lifelike. What is gained by making objectives all inclusive is not clear.

It is patent, however, that specific objectives afford opportunity for a critical analysis of what is being done in relationship to what has been planned. Objectives applied to the National Defense Program which would permit a critical analysis of accomplishments at a later date might include the following:

1. To provide specific training to fit workers for industrial employment or re-employment.

2. To discover special aptitudes and abilities in workers with a view toward development through training and placement through co-ordination.

3. To strengthen desirable personal qualities of the trainee, thereby making him more employable.

4. To refresh specific dormant and latent skills, abilities, and techniques possessed by those taking training under the Defense Training Program.

5. To restore the feeling of "belonging to the group" through contact with men, machines, tools, processes, instruction, and production in a successful going program.

Possibly you would add others to this list: surely, you would take at least one away. Regardless of what is done with the objectives listed, it is important that we should not long try to move forward without specific goals of attainment. Progress is not possible without a sense of direction: progress is not possible without a degree of specificity. Hope for evidences of genuine progress dims when objectives state:

To make better social beings.

To develop broad insight and understanding in industrial activity.

To develop habits which will permit the application of experiences gained in other fields to the solution of practical problems of everyday life.

The objection to such goals of attainment does not come from the fact that the objectives in themselves are not desirable, but rather it comes from the fact that such objectives are so generalized that they might be claimed for Latin, tennis, running a peanut stand, skipping rope, or visiting with grandpa. Such goals of attainment are the equivalent of moving the target closer in an attempt to teach the trainee to shoot straighter. They do not accomplish the purpose for which they were intended; they give you nothing to "get your teeth into"; they lack the quality of being specific.

Specific aim and objectives are needed by the teacher, the co-ordinator, and the administrator. Specific aims are needed by men on the firing line because in practice we weaken the skill of the individual as we move the target closer. Broad aims may be necessary to see the panorama as a unified whole; and such being the case, broad aims are best suited to use by the philosopher. National defense training will move out of the realm of the practical into the realm of the theoretical as we broaden our objectives from the specific to the general, but before we can claim practicality for our program we must establish specific attainable goals.

There is a safe middle ground, but in the training of defense workers two great dangers lie ahead: We can drift because we lack a port of call, or we can call until we're cut adrift.

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WHAT TO DO ABOUT FOG

If it's the least bit foggy during the day, use dim lights. At night, use the low beam of your headlights, and sit as high in the seat as possible.

Fog is composed of tiny globules of moisture. These little drops act like tiny, convex mirrors which reflect light back in your face. So, don't be dazzled by your own headlights. The higher you sit, the farther you are from the angle of light refraction. But the lower the position of your lamps, the better, because they take advantage of that two- or three-foot belt just above the earth that is likely to have the least fog. — *Milwaukee Safetygram.*

Course Outlines

Analysis of Radio-Serviceman's Trade

HAROLD R. GOPPERT*

Certain tools and skills are common to almost every radio repair job, and for the sake of brevity these are not listed specifically in each job outlined. Almost every repair operation entails the use of screw drivers, pliers, wrenches, soldering copper, and special aligning tools, and these are referred to as the common tools of the trade throughout this paper.

INSTALLING HOME RADIO SETS

What he should be able to do.	*What he should know.*	*Additional Information desirable for promotion.*
A. Install flat-top antenna. 1. Set up and anchor masts. 2. Connect insulators. 3. Connect aerial wire. 4. Connect lead in.	Methods of installation. Code regulations applying. Materials needed and their properties.	Understanding of principle of radio or electromagnetic waves, their propagation and spread. Directional characteristics of flat-top antenna and how to use them.
B. Install ground. 1. Connect ground clamp. 2. Drive ground rod if needed. 3. Connect set to ground clamp or rod.	Properties of good ground. Methods and material used in installing ground. Code regulations.	Function of the ground in a radio hookup.
C. Install doublet antenna. Same tools and processes as for flat-top aerial.	Circuits of doublet antenna systems. How to connect antenna transformers.	Principles of the doublet antenna systems and the various transformer systems used for suppression of local interference.
D. Place home radio set in service. 1. Unpack the set and remove special blocking. 2. Connect set to antenna system used. 3. Adjust set to its antenna, if adjustment is provided. 4. Make further adjustment as outlined under *Servicing Sets* if necessary.	Special methods used to protect sets in shipment. Method of adjusting antenna trimmer condenser for the set in question.	Principles of capacities in series.

INSTALLING AUTOMOBILE RADIO SETS

What he should be able to do.	*What he should know.*	*Additional Information desirable for promotion.*
A. Install set in car. 1. Use template to locate needed holes. 2. Drill holes. 3. Mount set and control unit. 4. Connect control cables.	How to read drawings. Construction of the set. How to read diagrams furnished, or enough of the functions of the parts of the set to be able to connect each to its proper control knob.	Some knowledge of auto parts and their functions to prevent interfering with the normal operation of the car.
B. Mount antenna unless one is built into the car. 1. Connect set to antenna.	How to properly locate, mount, and install the chosen antenna. Type of antenna which works best for the car.	Understanding of the theory of radio transmission to permit most efficient location and installation of the serial.
C. Insert suppressors and by-pass condensers in circuits of car where required for quiet reception. 1. Spark-plug suppressors. 2. Coil leads. 3. Breaker point condenser. 4. Generator condenser.	Automobile electric circuits. Understand the operation of auto electric equipment and the functions of resistors for suppressing noise and condensers for by-passing interference.	Understanding of theory of oscillations and oscillating circuits, and the effects of resistors in them.
D. Eliminate static from mechanical parts. 1. Install bonding springs or straps to brakes. 2. Other parts of car.	Parts which may generate static by friction and proper method of placing bonding to remove charges silently.	

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Locating Trouble in Radio Sets Which Do Not Operate Properly

What he should be able to do.	*What he should know.*	*Additional Information desirable for promotion.*
A. Be able to ask the proper questions to elicit information which may help him to find the trouble quickly.	Know and recognize the actions of the set and the probable causes for any abnormal functioning.	Thorough familiarity with the basic principles of electricity is almost indispensable. Familiarity with functions and working principles of all parts is necessary.
B. Make quick tests for localizing trouble without the use of meters which may save time of complete analysis. 1. Must recognize sounds emitted as grids are touched to learn which sections or stages of set are working. 2. Read diagrams.	Circuits of various stages. Functions of all parts and sections of the set.	Knowledge of design. Theory of operation of parts and circuits help make analysis.
C. Test tubes for proper functioning. 1. Use tube tester and interpret its readings. 2. Substitute tubes known to be good for those in the set, to learn if this makes the set operate properly. 3. Use tube charts.	Parts of the tube, and its operation. Operation of the tube tester used and significance of its readings. Types of tubes, and uses of each. Characteristic troubles caused by each.	Principles of operation of thermionic tubes. The electron theory. Electrical principles involved in tube operation: voltage, current, resistance, impedance, conductance, etc.
D. Use voltage, current analyzer to find trouble. 1. Operate analyzer. 2. Interpret its readings. 3. Use charts of proper readings in all parts of the set. 4. Read circuit diagrams and interpret them into parts of the set.	Significance of the reading of the analyzer in each circuit of the set. Circuit and construction of the analyzer. Proper reading of the analyzer in each circuit.	Know the design and theory of radio circuits and all electrical principles involved. Uses of inductances, condensers, and resistors, etc., in radio circuits.
E. Make *point to point* analysis of set, using voltmeters, milliammeters, ohmmeter, a combination of all three in one, or some type of continuity indicator as a neon test lamp, or some bridge circuits. 1. Use tools to insert meters and isolate circuits. 2. Interpret the readings obtained to know when they indicate faulty parts. 3. Use charts or table of correct values of voltage current resistance, conductance, impedance, and diagnose set readings. 4. Read circuit diagrams and interpret them into the set.	Proper values of current, voltage, and resistance for each part of the circuit. Recognize when these are off value enough to cause trouble being checked. How to connect the meters to be used and the purpose of each. Circuits of the sets to be tested and the use of each part.	Know the design of the meters used. Know theories involved in radio circuit design. Know circuits of each part of the set and effects of change in each.
F. Use a signal generator and vacuum-tube voltmeter or cathode-ray tube to check values of current and voltage on parts of a set too sensitive to be checked with ordinary meters as: automatic volume control, delayed automatic volume control, automatic frequency control, and noise suppressor circuits. 1. Connect and operate the signal generator. 2. Connect and operate a vacuum-tube voltmeter and interpret its reading. 3. Connect and operate a cathode-ray oscilloscope and interpret the trace obtained on its screen when used to indicate voltage or current. 4. Interpret the indications obtained in terms of the trouble in the set and diagnose repairs to be made.	Know the theory of a signal generator and how to connect and use it. How to connect and use the vacuum-tube voltmeter. How to connect and use the oscilloscope for indications of current and voltage.	Theory and design of the signal generator, vacuum-tube voltmeter, and cathode-ray oscilloscope, with their operating circuits. Theory involved in the operation of the automatic control circuits now used in radio sets.

What he should be able to do.	*What he should know.*	*Additional Information desirable for promotion.*
G. Test separate parts to make up the set as detailed in section on making repairs.	Functions of all parts used to make up a set and how to test each for its condition.	
Making Necessary Repairs on Radio Sets, After Diagnosis of Trouble		
A. Replace bad tube with good one. 1. Remove grid cap and shield. 2. Remove tube. 3. Insert another. 4. Replace shield and cap if used.	Use of each type of tube. Types which are interchangeable.	Know tube theory and design of thermionic vacuum tubes. Know improved types brought out to replace older ones.
B. Test and replace faulty resistors. 1. Use tools to remove and insert resistors in the set. 2. Use ohmmeter or bridge to measure resistor value and determine its usefulness. 3. Read and interpret charts and diagrams giving resistor values of sets. 4. What he should be able to do.	R.M.A. Color Code and its use. Types of resistor used for: voltage dividers, biasing resistors, tube loading, grid leads, bleeders, other purposes. How to choose resistor of proper power rating and value for a given location in set. How to recognize faults in resistor units of measure.	How to calculate total resistance of series or parallel combinations of resistors. How to calculate resistance from current and voltage readings.
C. Test and replace faulty condensers. 1. Use tools to remove and insert condensers in set. 2. Use condenser tester or neon lamp to test for: *a*) Leakage *b*) Short circuit *c*) Open circuit *d*) Power factor 3. Use ohmmeter to test condensers	Types of condenser used for various purposes in sets. 1. Filter condensers. 2. By-pass condensers. 3. Tuning condensers. 4. Coupling condensers. 5. Blocking condensers. Theory of operation. 1. Variable condensers. 2. Paper and mica condensers. 3. Electrolytic condensers. Significance of reading of any of the test devices used on condensers.	Design and theory of operation of the various kinds of condenser used in radio sets. Know how to calculate total capacitance of circuits having condensers in series or parallel. Design theories involving condensers in radio circuits. How to calculate reactance of circuits using condensers. Make power factor calculations.
D. Test and replace inductance coils. 1. Use tools to remove and insert coils and chokes. 2. Use ohmmeter or other continuity tester to measure resistance and check continuity. 3. Measure inductance and inductive reactance with a bridge or voltmeter and ammeter. 4. Rewind coils.	Purposes for which coils and inductances are used in radio sets and the proper size for each application. 1. Tuned circuits. *a*) Radio frequency transformers. *b*) Intermediate frequency transformer. 2. Filter chokes. *a*) Audio frequency. *b*) Radio frequency. *c*) Power supply. How to use and interpret readings of bridges and other methods of measuring inductance.	How to design inductance coils for radio use. Formulas for calculation of inductance, mutual induction, self-induction, inductive reactance. Effects of inductance and changes in it on radio circuits. Circuits used in measuring inductance and induction.
E. Test and replace transformers. 1. Use tools to remove and insert transformers in set. 2. Use ohmmeter or voltmeter and ammeter to test for: *a*) Continuity *b*) Voltage and turns ratio *c*) Impedance *d*) Resistance 3. Rewind and replace coils.	Circuits and uses of the various kinds of transformers used in radio sets. 1. Power transformer. 2. Audio frequency transformers. 3. Radio frequency transformers: *a*) Tuned *b*) Untuned 4. Intermediate frequency transformers. Type of transformers used for each purpose.	Design theory of the various types of transformers used in radio. Transformer formula.
F. Make mechanical repairs. 1. Use all tools listed as common for all operations. 2. Cut threads. 3. Make measurements, layouts, and work metal and insulating materials.	Mechanical construction of sets to be repaired.	
G. Align and neutralize tuned radio frequency circuits. 1. Use aligning tools. 2. Use signal generator. 3. Use meter to measure output, and interpret its readings.	Location of an alignment or *padding* condensers. All basic R.F. circuits and alignment procedure for each. Means of adjusting selectivity. Connections for the	Theory of radio frequency amplification and neutralization. Theory of signal generators. Circuits and theory of output indicating devices.

What he should be able to do.	*What he should know.*	*Additional Information desirable for promotion.*
a) Output meters. *b*) Vacuum-tube voltmeters. *c*) Cathode-ray oscilloscope. *d*) *Electric Eye* or other output indicating device. 4. Use tuning wand. 5. Read diagrams and interpret them into set.	signal generator and output indicating devices. Automatic frequency control circuits.	Theory of automatic frequency control.
H. Align circuits of superheterodyne receivers. *a*) Intermediate frequency circuits. *b*) *Tracking* and align oscillator circuits. *c*) Radio frequency section of set. 1. Use aligning tools. 2. Use signal generator. 3. Use output meter or indicator. 4. Use cathode-ray oscilloscope. 5. Use tuning wand. 6. Read and interpret diagrams and charts.	Alignment procedure for superheterodyne. How to identify sections of superheterodyne receiver. How to apply the signal generator and output meters to superheterodyne receivers, and to isolate circuits. Necessary adjustments and procedure to be followed in making each.	Operation and design theory of superheterodyne receivers. Theory of visual alignment with cathode-ray oscilloscope.
I. Adjust sensitivity of radio set. 1. Use tools to change resistors, rheostats, and condensers which control sensitivity, as discussed in paragraph B and C of this section. 2. Measure sensitivity.	Circuits used to control sensitivity. *a*) Standard sets. *b*) Sets with automatic volume control and delayed automatic volume control. Effects of changes of resistance on voltage of circuits involved. Effect of voltage changes on sensitivity of tubes of sections of set. Methods used to make adjustments.	Theory involved in design of circuits and tubes which control sensitivity.
J. Adjust or repair loud-speaker or sound reproducer units. *a*) Magnetic speakers. *b*) Dynamic speakers. 1. Use tools to dismantle and assemble speakers. 2. Make continuity tests. 3. Align armatures and cones. 4. Replace voice coils. 5. Replace or remagnetize permanent magnets. 6. Replace field coils. 7. Secure mechanical rigidity. 8. Rewind coils.	Purpose of each part of a speaker. Proper connection of the various coils used. Effects caused by various faults in speakers.	Theory of sound propagation and transmission.
K. Adjust and repair vibrator units in auto sets and in direct current sets. 1. Remove and inspect vibrator unit. 2. Test vibrator for proper operation with: *a*) Vibrator tester. *b*) A.c. and d.c. voltmeters. *c*) Cathode-ray oscilloscope 3. Make repairs when possible or replace with new unit.	Circuits and uses of the vibrator. Troubles caused by the vibrator and proper remedies.	Design theory of circuits using vibrator to change direct to alternating current.
L. Replace set in cabinet. 1. Use proper tools.	Proper methods of mounting various units.	

The advanced cabinet shop of the Macomber Vocational High School, Toledo, Ohio, is equipped for classes of thirty. Benches and machinery are so located that maximum utility, adequate lighting, and safety are promoted

Outline for Course on Care and Repair of Tractors, Trucks, Automobiles, and Gas and Diesel Engines

ELWYN R. DELL*

This outline was developed for an out-of-school rural youth class which met evenings to study about the care and repair of tractors, trucks, automobiles, and gas and Diesel engines. The course ran for ten weeks. The classes met in three local garages, alternating every two weeks. The teacher took care of the theoretical instruction, while instruction on the practical points were taken over by one of the mechanics at the shop where the class was meeting.

The student was asked to check this outline so that he could pattern his classwork to get in as many of the specific jobs in which he was interested. He was furthermore directed to check off the jobs as fast as they were completed.

I. *Operation of Vehicles* (includes starting, stopping, and backing *under construction*).
- A. Passenger buses.
- B. Trucks.
- C. Automobiles, new and old models.
- D. Tractors, several different kinds and models.
- E. Stationary plants, not vehicles.

II. *Lubrication*
- A. Routine service lubrication, including usual checks.
- B. Pack front wheels.
- C. Remove and replace transmission grease.
- D. Remove and replace differential grease.
- E. Grease steering gear.
- F. Change crankcase oil.

III. *Laboratory Tests*
- A. Coil.
- B. Condenser.
- C. Points.
- D. Timing.
- E. Primary circuit.
- F. Battery.
- G. Compression.
- H. Manifold vacuum.
- I. Combustion.
- J. Fuel pump vacuum.
- K. Fuel pump pressure.
- L. Oil pump pressure.
- M. Spark plugs.
- N. Magneto.

IV. *Wiring and Lighting*
- A. Repair broken wire.
- B. Remove and replace light bulb.
- C. Install fan motor on heater or ventilator.
- D. Replace worn or broken wires.
- E. Remove and replace sealed headlight.
- F. Install lights on tractor or trailer.
- G. Install switch.
- H. Remove and replace ground strap.
- I. Remove and replace cable.

V. *Generators*
- A. Remove and replace voltage regulator.
- B. Adjust voltage regulator.
- C. Adjust third-brush generator.
- D. Remove and replace armature.
- E. True armature on lathe.
- F. Remove and replace brushes.
- G. Remove and replace bearing.
- H. Take apart, inspect, and reassemble.

VI. *Starting Motors*
- A. Remove and replace starter.
- B. True rotor in lathe.
- C. Remove and replace brushes.
- D. Install new spring.
- E. Take apart, inspect, and reassemble.
- F. Replace worn bolts and washers.

VII. *Battery Ignition*
- A. Remove and replace coil.
- B. Remove and replace condenser.
- C. Remove and install points.
- D. Clean and adjust spark plugs.
- E. Adjust points.
- F. Rebuild distributor.
- G. Remove and replace distributor.
- H. Remove and replace battery.
- I. Charge battery.
- J. Time firing.

VIII. *Magneto Ignition*
- A. Remove and replace magneto.
- B. Time firing.
- C. Remove and replace points.
- D. Clean and adjust spark plugs.
- E. Rebuild magneto.

IX. *Connecting Rods*
- A. Remove and replace rod.
- B. Remove and replace bearings.
- C. Take up rod bearings.
- D. Inspect rod bearings.

X. *Crankshaft*
- A. Take up main bearings.
- B. Remove and replace main bearings.
- C. Measure shaft with micrometer.
- D. Remove and replace shaft.

XI. *Pistons*
- A. Remove and install piston.
- B. Remove and install rings.
- C. Remove and install wrist pin.
- D. Peen piston for expansion.
- E. Measure piston with micrometer.
- F. File rings for clearance.
- G. Fit pin.

XII. *Cylinders*
- A. Measure cylinder with micrometer.
- B. Remove ridge at top of cylinder.
- C. Hone cylinder.
- D. Rebore cylinder.
- E. Polish cylinder.
- F. Remove and replace sleeve.

XIII. *Timing Gears and Camshafts*
- A. Remove and replace timing gears.
- B. Set timing gears.
- C. Remove and replace camshaft.
- D. Install new cam followers.
- E. Inspect timing gears.

XIV. *Valves*
- A. Remove and replace valve.
- B. Reface valve.
- C. Reseat block.
- D. Grind valve.
- E. Adjust tappets.

XV. *Fuel Systems*
- A. Remove and replace pipe line.
- B. Install new manifold gaskets.
- C. Adjust carburetor mixture.
- D. Clean carburetor.
- E. Rebuild carburetor.
- F. Remove and replace carburetor.
- G. Adjust float level.
- H. Install exhaust heater.
- I. Remove and replace muffler.
- J. Repair fuel gauge.
- K. Clean air filter.

XVI. *Cooling System*
- A. Test cooling liquid for freezing.
- B. Clean and flush.
- C. Remove and replace hose.
- D. Remove and replace water pump.
- E. Remove and replace fan belt.
- F. Solder radiator.
- G. Install hot-water heater.
- H. Remove and replace thermostat.

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I. Repair heat indicator.

XVII. *Oiling System*
- A. Flush crankcase and engine.
- B. Clean pump.
- C. Remove and replace pump.
- D. Remove and replace oil line.
- E. Repair oil gauge.

XVIII. *Front End*
- A. Alignment.
- B. Straighten axle.
- C. Rebush.
- D. Tighten front wheels.
- E. Measure camber and caster.
- F. Remove and replace spring.

XIX. *Steering Gears*
- A. Adjust gear for play.
- B. Remove and replace steering-column assembly.
- C. Adjust linkage.
- D. Remove and replace rod-connecting assembly.

XX. *Brakes*
- A. Adjust.
- B. Free frozen cables.
- C. Remove and replace shoe.
- D. Reline shoe.
- E. Turn rough brake drum.
- F. Bleed line.
- G. Add fluid to well.
- H. Inspect air brakes and controls.

XXI. *Rear Axle*
- A. Remove and replace axle.
- B. Remove rear wheels.
- C. Remove and replace bearing.
- D. Remove and replace ring and pinion gears.
- E. Take apart, inspect, and reassemble differential.
- F. Adjust gear mesh.
- G. Remove and replace spring.

XXII. *Clutch*
- A. Adjust play in pedal.
- B. Remove and replace release bearing.
- C. Remove and replace disk.
- D. Remove housing, inspect, and reassemble.
- E. Remove and replace complete assembly.

XXIII. *Transmission* (drain and flush before removing if possible).
- A. Remove, inspect, replace.
- B. Remove and replace bearing.
- C. Remove and replace gear.
- D. Remove and replace shaft.
- E. Adjust shifting assembly.

XXIV. *Universals and Propeller Shafts*
- A. Remove housing and inspect universal.
- B. Remove and replace universal.
- C. Remove and replace propeller shaft.
- D. Remove and replace shaft bearing.

XXV. *Tires and Wheels*
- A. Remove, inspect, and replace tire (passenger car and truck).
- B. Hot patch tube.
- C. Install duals.

XXVI. *Body*
- A. Tighten bolts.
- B. Install glass.
- C. Remove small dents.
- D. Install fender.
- E. Clean interior.

XXVII. *Miscellaneous*
- A. Remove and replace engine.
- B. Install new gaskets.
- C. Remove head, inspect, reassemble.
- D. Take apart, inspect, and reassemble supercharger.
- E. Inspect Diesel Engine.

(Add others to this list as they appear.)

Photography in the High School

R. H. BEHRENS*

A survey recently made by the *Saturday Evening Post* lists photography as the second hobby most universally indulged in by the people of the United States, first place having been achieved only by the sum of all the collecting hobbies practiced by the young and old. Whenever widespread and vivid interest is observed among the populace at large, the school as a rule reflects this interest since the school is of course only the organized means of keeping in circulation ideas and skills which present society wishes to perfect and preserve. Through the years, therefore, we have seen, and may expect to continue to see, an interesting pageant of activities, vocational and avocational, which have become crystallized into bodies of knowledge and skills with legitimate claims on the secondary, and even the elementary school program. The newer subjects must of course justify their existence in the curriculum, not as fundamental studies for all students, but as legitimate disciplines for individual members of a highly individualized society.

The present status of photography lends itself admirably to a place in the industrial-arts program. It rests on a solid body of highly developed scientific principles which need to be understood by the humblest practitioner of the hobby, if not completely mastered by him. It embodies a large amount of mechanical progress, which for better or for worse, appears to be an incentive to most persons today, and its results have a contemporary appeal testified to by the vast number of modern publications which are scarcely more than pictorial compilations of the modern scene. Hardly an activity today which is not served by photography. Responding to this great interest in the photographic arts, a number of schools have introduced more or less formally organized clubs or courses to focus the photographic interests and needs of the school community. The suggestions garnered from experience and presented here are written with the hope of rendering some assistance in furthering a program already established and in crystallizing the scattered interests of pupils, teachers, and administrators in places where such instruction has not as yet been organized to provide the advantages of systematic instruction.

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Inaugurating the Course

Inaugurating a photographic course in the high school is usually an easy task from the standpoint of securing immediate attention. Neither do darkroom facilities present a problem where a well-organized industrial-arts program is already in existence. The demand for pictures to be used in school publications and for school activity records easily offset the few expenditures necessary for the basic expenses to launch the photographic course. Photographic equipment in considerable amounts is often available at the outset and may serve as a working basis for a more highly elaborated course of instruction later on. Moreover, students interested in photography already own cameras, so that costly duplication of the essential tool, the camera, becomes unnecessary.

In order to justify itself, the course must provide organized instruction in photography; assignments of projects are by themselves wholly inadequate to fill in the gaps in the fundamental understanding of photography without which even the most skilled young photographer will eventually bog down as he attempts to extend his photographic horizon. A number of excellent and detailed course outlines are available through the service departments of manufacturers of photographic equipment as well as in the relatively few available textbooks among which "Elementary Photography" by Neblette, Brehm, and Priest (Macmillan, 1939) deserves special mention.

Since many students in the senior high school have already mastered most of the basic photographic skills, projects must be emphasized so that the student may extend his grasp to suit his particular purposes and abilities. Photographic work incidental to school activities and school publications provides the best project material since the young photographer receives the stimu-

lus which comes from attempting to satisfy a large group of his contemporaries and to meet the competition from other student photographers. *School-press photographers* as a rule take their assignments seriously and often develop fine photographic ability. Motion pictures, sometimes colored, of athletic events and special pageants put the young photographer on his mettle in insuring the best results for the student body which at times goes to considerable expense to preserve the records of exciting events for the pictorial archives of the school.

Instruction and Project Work

To provide a nice balance between systematic instruction and project work becomes a real challenge to progressive experienced teachers. In the interest of a well-rounded course, he must hold to an organized program of instruction in the more qualitative type of photographic physics and chemistry as well as in the more fundamental art principles. In the interest of the development of individual style and interests, idiosyncrasies must be respected and stimulated.

Lens sets commonly used by the physics laboratories of the high school to demonstrate the bending of light rays and some of the characteristics of double-convex, double-concave, meniscus, plano-concave, and plano-convex lenses, serve admirably to demonstrate the subject of lenses to the student of photography. At times it may become highly desirable to depart from the qualitative phases of the scientific applications of the fundamental physics and chemistry of photography and to present, with demonstrations, experiments, and problems dealing with the well-known basic lens formula $\frac{1}{f} = \frac{1}{D_1} + \frac{1}{D_0}$. A commercial view camera is helpful in tying up this formula with its numerous applications to photography, such as determining measurements for building enlargers and for adjusting the size of bellows to various lenses, etc.

Applications of the more advanced principles of the physical chemistry underlying photography may often be reduced to such simplicity that students of the lower high school grades may have no difficulty in understanding them. The principle of "gamma," for example, as applied to the development of negatives, may be demonstrated in terms of a series of negatives made under controlled conditions and interpreted in terms of a curve the mathematical derivation of which may well remain a mystery to the student. Fundamental chemical factors in photography such as the effect of light on the silver halides may be readily demonstrated to students lacking formal chemical training by precipitating silver chloride, iodide, and bromide in test tubes without and in the presence of gelatin. The dispersive effect of the gelatin at once becomes apparent, and the nature as well as the relative speed of the darkening of these salts may easily be demonstrated in the presence of sunlight.

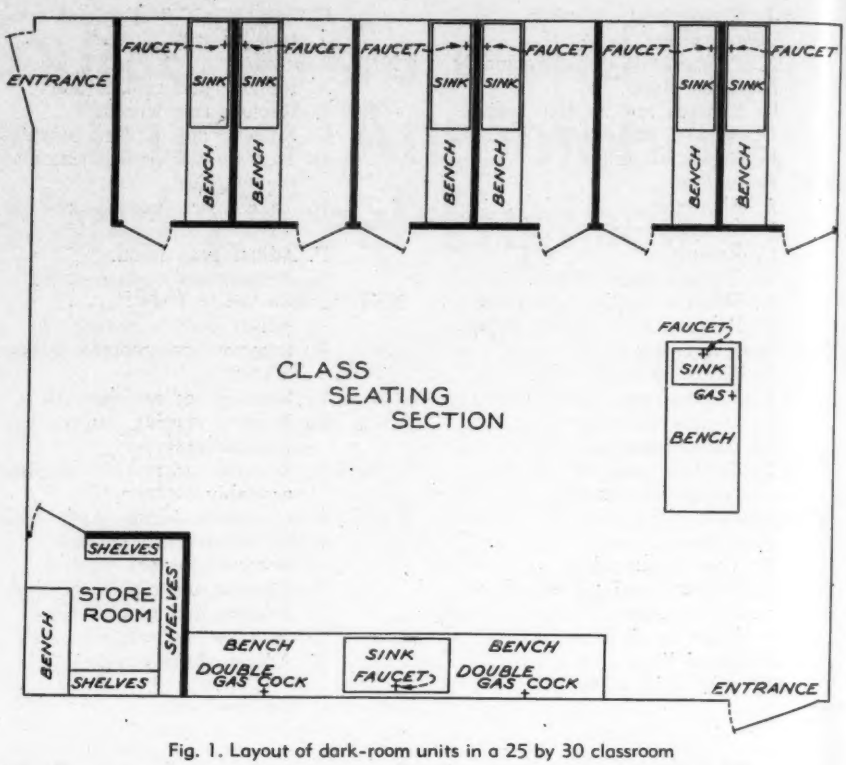

Fig. 1. Layout of dark-room units in a 25 by 30 classroom

Repetitive experience in making up developers, fixers, and stop baths afford the students an excellent opportunity in learning the use of the thermometer, strength of photographic chemicals, and the necessity for accuracy and cleanliness in photographic processes. An experiment which never fails to interest the student, although of no immediate practical value, is the making of his own photographic plate from gelatin, silver salts, and the halides. These plates, however unfavorably they may compare with commercial products when actually exposed in the camera, developed, fixed, and printed, are often highly prized by the makers. The experiment paves the way for thorough instruction in the characteristics of commercial photographic emulsions.

The high school class in photography furnishes an ideal setting for frequent print clinics where the student photographer may enjoy the give and take of criticism of others — a criticism especially helpful because it is offered by others sufficiently close in training, interest, and abilities to be of more value in some respects than the teacher's. The print clinics also furnish a natural setting for the intensive study of special phases of photography; such as portraiture, landscape photography, photomicroscopy, and trick photography.

Darkroom Arrangement

The laboratory for the course in photography is the photographic darkroom, of course, and forms as indispensable a part of the instruction as the laboratory of any science course. Many admirable plans for darkrooms to serve the needs of individuals and small groups may be found in the literature of photography, but the school darkroom in which economy in space and duplication of equipment present serious problems, special provisions are needed. A series of small but complete units containing water, light outlets, and drainage, lend themselves admirably to most of the needs of the high school course in photography. A photographic classroom built in a 25 by 30-ft. room, and containing six laboratory units is shown in Figure 1.

Each unit is provided with two water outlets, one a simple faucet and one a hose connection for attaching washers and the like. Four plug outlets to the electrical circuit provide outlets for enlargers, printing boxes, and safe lights. Ventilation, an extremely important factor often neglected in the amateur darkroom, must be provided

View showing individual dark-room units. Built in a 25 by 30 ft. classroom

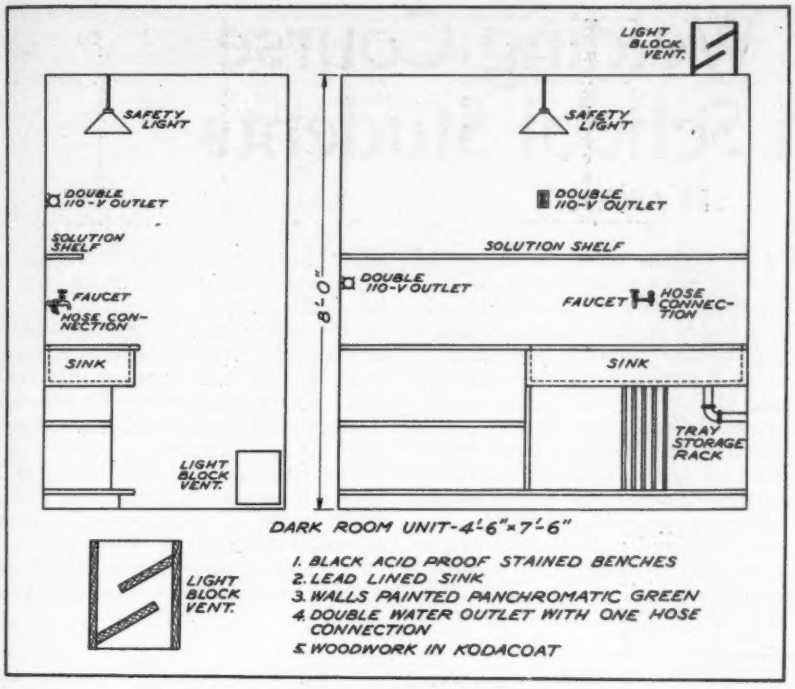

Fig. 2. Interior arrangement of individual dark-room unit

to safeguard the health of the student. See Figure 2. The walls of the unit may be painted in a light green especially prepared for its high visual reflecting power and low actinic effect. This paint, called panchromatic green, may be obtained from photographic dealers.

A low, shallow sink, made of wood and lined with sheet lead provided with a wooden grating serves as an excellent place in which to carry on developing and printing, since any spilling by the learner may easily be washed away.

These darkroom cubicles, built to accommodate up to three students at a time, permit great flexibility in instruction. Developing, printing, and enlarging may be carried on simultaneously, thus duplication in equipment is avoided and project work is greatly facilitated.

Other Equipment Needed

Some form of laboratory bench with gas outlets, sink, and water is desirable. This bench may be used in the preparation of solutions, carrying out daylight photographic processes such as those of intensification, reductions of negatives, as well as the spotting and mounting of prints.

A demonstration bench for the instructor, also provided with gas, water, and electrical outlets, is useful as is a stock room and some means of darkening the room for projection and for optical demonstrations.

It has been previously stated that the individual pupil usually provides his own camera. A commercial view camera, preferably of 5 by 7-in. size, provided with double bellows, anastigmatic lens, lens board, and with a rising front and swing back is essential. This camera will serve as a means of demonstrating all the elements of the camera as well as the principles of copying, photographing large groups, and using telephoto and wide-angle lenses. An electric type exposure meter and a solid tripod are essential.

Developing tanks for roll and cut film are needed. For amateurs the commercial tanks, however practical and economical they may be, are not so well adapted for the amateur photographer.

Devices such as printing boxes and enlargers may be constructed where shops are available, from any of the many excellent designs to be found in photographic texts and photographic magazines. Enlargers, trays, timers, safelights, etc., should be considered basic equipment. Films, papers, and photographic chemicals are needed in limited amounts for demonstration purposes. Students may be encouraged to bring their own photographic work and materials for use in instruction. For work done for the school, or for individuals in the school, materials are usually provided. Photographic solutions are supplied to students in small bottles numbered and sufficiently large to fill tanks or trays. This enables the instructor to check materials and to prevent waste.

Frequent exhibits, in which the student body is invited to participate serves to stimulate interest and effort on the part of the photographers in the school and also to recruit students for the photography course. A camera club, where it exists, may undertake this function.

It would be an oversight indeed to close this article without mentioning the important vocational aspect of such a course. Not only does it serve the hobbyist but it often serves as a means for the immediate placement of students upon graduation into one of the many photographic occupations.

Eleven Good Driving Rules

For motorists who would avoid the winter casualty lists, Mr. Julien H. Harvey, managing director of the National Conservation Bureau, accident-prevention division of the Association of Casualty and Surety Executives, recommends the following rules:

Reduce average speed below that used in months when there is no snow or ice.

Reduce night speed below daytime speed.

Drive steadily, avoiding sudden starts, stops, and turns.

Watch out for children on sleds, especially where roads are hilly.

Keep brakes and air pressure in all tires equalized.

Remember that pedestrians will be wearing dark clothing and will be less visible, so slow down and be particularly watchful at crossings.

Since stopping on ice requires about 5 times as great a distance as stopping on dry pavement, allow for considerable stretch for stopping.

Apply brakes gradually and use second gear to help slow down the car, especially when going down hill.

Keep the windshield wiper and defroster in good condition; always check them before starting on a trip.

Use chains on packed snow or ice, but do not depend on them to save you from trouble at high speed.

Do your driving during daylight hours as much as possible, keeping in mind that there are from 3 to 4 hours less daylight during the winter than during the summer months.

Repairing Gasoline Tanks

We are indebted to the National Board of Fire Underwriters for the following information:

"All automobile repair shops are called upon to repair, solder, or weld gasoline tanks used for fuel supply on automobiles. Some attempt has also been made to weld or repair gasoline service station tanks which have developed leaks.

"Many people have the mistaken idea that flushing these tanks with water will make them safe to work on, but this is seldom sufficient and there have been many cases of violent rupture of the tank. Steaming the tanks is a little better, but does not assure safety.

"The most desirable means is to empty the tank and then to put in come carbon tetrachloride and let the tank stand for about half an hour. Carbon dioxide, either in the form of dry ice or as a discharge from a carbon-dioxide extinguisher, can be used. One pint of carbon tetrachloride will produce 4 cu. ft. of gas and should be sufficient for a tank of 65 gallons' capacity. A pound of dry ice or of carbon dioxide should be sufficient for a tank of 125 gallons capacity. These are on the basis of producing a mixture where 50 per cent is either carbon tetrachloride or carbon-dioxide vapor."

Electric Welding Course for High School Students

LEE ARNOLD*

The field of electric welding is rapidly expanding to the extent that any school supporting acetylene welding should include electric arc welding.

The teaching of electric welding is essentially a series of exercises ranging in order from the simple bead to the difficult vertical up weave and overhead fillet weld. It must be in the form of exercises, because a novice is not ready to go into the field of welding tanks, bridges, and heavy construction with a small amount of experience.

Electric welding is fascinating to the extent that a student is content to work on exercises until he can make a good weld of the type he is attempting, and he will take as much pride in a good weld as if it were a piece of structural work.

It is a highly skilled occupation, and a welding operator receives good pay to compensate for the hazards connected with welding.

This outline with the *Do* and *Know* columns is in the approved form of outlines used by various apprenticeship training agencies. The content of the outline may differ in accordance with facilities and time. This outline is designed to give at the very least 100 hours or a semester's work in high school.

Emphasis should be placed upon the safety factor and booths should be provided which have an exhaust fan and light-tight curtains.

This outline may be used by addition of job sheets supplementing each exercise. In either case, each lesson is preceded by a demonstration, and during the lesson frequent observations and inspections are made by the instructor.

The order of operations given in this outline is essentially the same as that followed by the Lincoln Electric Co.'s welding school at Cleveland, Ohio. The firm has kindly granted permission to embody some of its material in the course outline given here.

The Machine and Controls

Do	*Know*
1. Familiarize self with equipment. *a*) Set machine according to chart. *b*) Trace polarity of electrode. *c*) Change polarity. *d*) Get proper hold of electrode holder. *e*) Adjust shield for head. 2. Operation. *a*) Start machine. *b*) Stop machine. *c*) Locate the voltage control. *d*) Locate the amperage control.	1. How to change controls. 2. Polarity — definition. 3. 1st aid — flashes. 4. Why change polarity? 5. Types of machines. *a*) D.c. *b*) A.c. 6. Safety precautions. 7. Head shields. *a*) Shade of glass. *b*) Type of shield to use. 8. Aprons — type to use. 9. Type of gloves to use.

Flat Welding and Cutting

Do	*Know*
1. Set machine. 2. Practice striking an arc. 3. Run smooth beads without breaking arc. 4. Clean each bead. 5. Build up pad as demonstrated by instructor. Check each new operation with instructor. 6. Set machine wide open for cutting and cut some scrap as demonstrated by instructor. 7. Set machine for welding again. Change polarity and use rod and run beads. 8. Have instructor check each operation and weld, in all the following welds until course is completed. 9. Make simple butt joint for flat weld. 10. Make single V. 11. Make double V. 12. Make single U. 13. Make double U. 14. Make lap joint using weave motion. On all stock over ¼ in. thick have V on one side. On stock over ½ in. thick have V or U on both sides.	1. What is polarity? 2. Angle of holding electrode. 3. Two methods of striking arc. 4. Difference between Common rods. 5. Theory of shielded arc. 6. Direction of travel. 7. Causes of sticking. 8. Cause and effect of *arc blow*. 9. Why clean each bead? 10. Proper arc length. 11. Distinguish between metallic, washed, semicoated, and shield arc electrodes. 12. Where used? 13. Symbols used to designate type of weld.

Fillet Welding

Do	*Know*
1. Set up metal and tack in place. 2. Make single-pass fillet T weld. *a*) Single motion. *b*) Weave. 3. Three-pass fillet weld. *a*) 1st bead and clean. *b*) 2nd bead — clean off scale. *c*) 3rd bead and clean. Practice until a presentable weld can be made.	1. Where to use this type of weld. 2. Type of rod to use. 3. Relative strength. 4. Polarity to use. 5. Current setting. 6. Where to use this weld. 7. Why clean each bead? 8. Sequence of beads. 9. When a weld is a good weld. 10. Length of arc.

Horizontal Butt Weld

Do	*Know*
1. Make horizontal butt weld on two sides. *a*) Set up metal and set current. *b*) Tack. *c*) Weld on one side and inspect. *d*) Weld on other side.	1. Where used. 2. Type of rod to use. 3. Polarity to use. 4. How to inspect weld. 5. Motion of rod. 6. When proper penetration is reached. 7. Length of arc.

Vertical Down

Do	*Know*
1. Vertical down weld (single pass). *a*) Set current and polarity. *b*) Use bouncing ball motion. *c*) Set up metal (light gauge). *d*) Tack. *e*) Make weld. 2. Use on light gauge metal only.	1. Where used. 2. Type of rod to use. 3. Polarity to use. 4. What to look for in good weld. 5. Motion of electrode. 6. Length of arc.

Vertical Up — Hardest of All Welds to Master

Do	*Know*
1. Single pass. *a*) Set up and tack. *b*) Make weld as shown by instructor.	1. Where used. 2. Type of rod to use. 3. Polarity to use. 4. Current to use.

*High School, Grand Haven, Mich.

2. Single-pass weave.
3. Three-pass single and weave. Practice until acceptable weld is made.
5. Why clean each bead.
6. Motion of rod in case of each kind of weld.
7. Undercut — cause and remedy.
8. Spatter — cause and remedy.
9. Length of arc.
10. Types of weave.

Overhead Fillet

Do	*Know*
1. Single overhead bead. *a*) Set up material and weld as shown. 2. Three-pass overhead. Fillet or T weld. *a*) Corner bead. *b*) Upper bead. 3. Lower bead. Check each for penetration, undercut, and pinholes. 4. Be sure to clean each bead before next one is started.	1. Length of arc. 2. Current setting. 3. How to hold electrode. 4. Protective clothing. 5. Type of rod. 6. Cause of pinholes. 7. Cause of undercut. 8. Cause of drops of metal forming. 9. Why clean each bead. 10. Sequence of each pass. 11. Where to use this type of weld.

Cast Iron Welding

Do	*Know*
1. Make a weld in cast iron without cracking the weld or the metal. *a*) Weld short distance at a time. *b*) Peen while cooling. *c*) After sufficient time repeat *a* and *b*.	1. Type of rod to use. 2. Polarity. 3. Speed of welding. 4. Treatment of weld while cooling. 5. Composition of cast iron. 6. Characteristics of cast iron.

Carbon Arc and Nonferrous Welding

Do	*Know*
The following operations require much practice. 1. Weld cast iron with a filler rod. Carbon-rod electrode. 2. Braze or bronze weld. 3. Aluminum weld. *a*) Set for proper polarity and practice on scrap until weld is mastered.	1. Type of filler to use. 2. Flux to use. 3. Current setting. 4. Polarity to use.

Additional Study

Do	*Know*
Make out a job cost sheet of a practical welding job.	1. Qualifications of welding operators. 2. Welding codes. 3. How to estimate a job.

Curriculum Revision for Defense

DON R. McMAHILL*

Of interest to others engaged in industrial and vocational work, are the following outlines of courses released recently by Edwin Parrish, head of the department at Technical High School, Omaha, Neb. Mr. Parrish, incidentally, is also principal of the night-school work at the same school, and is expected to cooperate closely with officers of the new Martin bomber plant at Omaha in establishing preapprentice classes similar to those now functioning at Baltimore.

The first two grades, it will be noted, are devoted to exploration. Careful selection determines the best avenue for the boy to follow as he enters his third year of secondary training.

Much emphasis is placed on guidance, co-ordination, and instant revision of curriculum to fit the needs at hand.

9th Grade

The work of this group is divided into four units of nine weeks each with two class periods of 40 minutes each, five days per week. All boys taking a technical course are expected to enroll in these exploratory courses.

I. *Housing*
   a) Beginning woodworking
   b) Finishing
   c) Glazing
II. *Metalwork*
   a) Sheet metal
   b) Bench metal
   c) Plumbing
III. *Electricity*
   a) Wire splicing
   b) Circuit building
   c) Transformer construction
IV. *Concrete cement work*
   a) Form construction
   b) Mixing and finishing
   c) Bricklaying

The mechanical drawing of this grade consists of a single 40-minute period, five days a week. This work is taught by men who are responsible for only this part of the program. At present an attempt is being made to correlate the drawing with the type of exploratory shop course the boy might be engaged in.

10th Grade

Upon completion of the exploratory courses of the 9th grade, the boys are permitted to select one of the industrial-arts prevocational courses. The work is based on two class periods of 40 minutes each, five days per week.

I. Auto mechanics
II. Carpentry
III. Electricity
IV. Machine shop
V. Mill cabinetwork
VI. Patternmaking and foundry
VII. Sheet metal

The mechanical drawing consists of the same time limits and aims as in the 9th grade. A reorganization of the drawing will result in a boy getting drawing that correlates with the shopwork he is engaged in.

11th–12th Grades

At the completion of the 10th grade prevocational courses, three avenues are being formed for outlets in the 11th–12th grades. Careful selection through the guidance department and shop records will determine the best avenue for a boy to follow. Of course, no sight is lost of the boy's wishes in regard to choice of course. It is quite possible that other factors may not come to light even at this stage of the boy's training.

Smith-Hughes Vocational Courses

a) Auto mechanics
b) Carpentry
c) Electricity
d) Machine shop
e) Sheet metal

The boys, who by previous record are prepared, are permitted to select one of the five courses listed. We recognize the fact that a small number of the boys should be permitted to get very specialized work. These boys will spend six periods of 40 minutes each, for five days, in such specialization. Four of the periods will be in actual shopwork, while two periods are reserved for the teaching of related technical material.

In the 12th grade the boys are placed where possible in work with private concerns. The usual four periods of school shopwork is given for the part-time work. The students receive a regular full apprentice wage in accordance with the federal laws.

The five instructors teaching under this arrangement spend the last two periods

*Technical High School, Omaha, Neb.

of each day in co-ordinating. They visit business firms which are engaged in the type of work they teach. During these two periods, students (who would otherwise be in shop classes) are given English and social-studies work.

Semivocational Courses

a) Cabinet millwork
b) Patternmaking and foundry

The boys who desire to follow this work, spend four periods of 40 minutes each, five days per week in the shop. Some of this time may ultimately be given over to related and technical subjects.

Semiskilled Courses

a) Industrial electricity
b) General metals
c) Transportation
d) Woods

It should be remembered that every adjustment of curriculum in itself soon calls for adjustment. In other words, these courses are in the formative process. They are offered in order to take care of the boys who lack the ability for specialized vocational work, and still have an interest in some form of vocational work.

Any boy can find an outlet in this arrangement to meet his vocational desires. Every attempt will be made to allay the feeling that a boy is being "shunted" as he makes the somewhat final decision between the 10th and 11th grades. These boys will get diversified skills which should eventually place them well in local industries. Many skills are preferable to few skills in the Omaha area.

Drafting work is offered in the 11th-12th grade for boys who want to follow a drafting course, or are engaged in pre-engineering work. Such work is divided into architectural or mechanical-drawing classifications.

It should be apparent that this outline is readily adaptable to any emergency which might call, even overnight, upon the vocational-industrial art department of this school. It might be said that this is one stage of national defense — and Omaha is doing its part to be prepared for the next stage.

Miscellaneous

Graphic Aids in Continuous Occupational Analysis

CLYDE A. BOWMAN*

Much work has been done in the analysis of occupations. Various procedures have been proposed and various forms for recording the analyses have been advocated. Industrial-arts teachers are experiencing increased pressure from their superintendents, principals, supervisors, and department heads. These pressures, in many instances, arise in the curriculum committee developments. Industrial-arts teachers are asked to do their share in the modifications of curriculums, to increasingly contribute to the social adjustment of the growing individual. They also are asked to integrate their work with home economics, fine arts, and other fields in the development of programs of practical arts for both boys and girls. Vocational, trade, and industrial teachers are confronted each year with students who are older in years, and more advanced in their achievement levels in the grades in their general education program in the junior and senior high schools. They are also confronted with young adults and older adults who come for adjustment training. These are adults whose occupational territory either has changed to a marked degree or is changing. They come for vocational trade and industrial training which will enable them to meet the changing requirements in their jobs, or for training to help them secure new jobs when their present jobs cease to exist. The developing situation, then, for both the industrial-arts teacher in the modern curriculum, and the vocational, trade, and industrial teacher in the modern vocational and adult education school, is one which calls for continuous occupational analysis activity. For the teacher himself in his own occupation as a teacher, and for the teacher's pupils, there is continuous need for the identification, interpretation, and translation into educational opportunity in connection with our modern social-industrial environment. In short, continuous occupational analysis work is of first importance if the industrial-arts teacher, and the trade and industrial teacher are to do that which is so difficult for all adults, namely, to keep pace with the commonplace.

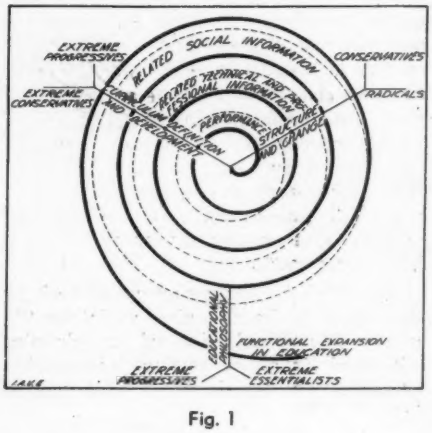

Fig. 1

The 1933 report of the National Education Association on the Social Economic Goals of America placed emphasis on the necessity for habituating Americans to change. In most instances, the procedures and the recording forms used in occupational analysis have been adapted to the working situations in which the analyses are to be used. In virtually all situations where occupational analyses have been used, there has been the constant problem of keeping the analysis up to date. Whatever the procedure used and whatever the form for recording has been, changes in the occupation itself have rendered portions of the analysis obsolete in the course of time. The rapidity with which these changes affect the analysis varies in different occupations. If students in our high schools, vocational schools, and adult-education classes are to be accustomed to change, procedures which make the social-industrial pattern in our environment more

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tangible are significant helps. The purpose of this brief article is to suggest some of the directions in which graphic aids may be developed and maintained in continuous occupational analysis.

Occupational analyses have been made and used in planning and operating instruction on a full-time, part-time, and cooperative basis. These analyses have been made in some instances by individuals, in some cases by departments, and in some cases by curriculum or survey committees. They have been used in public general education, in special training programs, and a variety of instructional plans in private industry. Guidance services, placement services, private business organizations, as well as many individuals, have sought occupational analyses on an extensive scale.

Figure 1 suggests in condensed form, the sources and extremes in the pressures on the teacher. With the teacher's professional performance in the center, the related technical and professional information which he needs to adequately perform, is indicated in the next circle. Immediately outside of this is the related social information which he needs. Bearing in on his performance, controlling it, defining it, and evaluating it are educational philosophy, social structure and change, and curriculum definition and development. In educational philosophy, we have extreme progressives at the left, and extreme essentialists at the right. One distinction frequently used in defining these extremes has been to indicate the extreme progressive as the advocate of the child as the chief control in determining what shall be learned, and the extreme essentialist as the advocate of the content as the chief control in determining what shall be learned. The extremes in the social structure and change are the traditional radicals and conservatives. The extremes in the curriculum definitions and developments are the extreme progressives and extreme conservatives. The distinctions in curriculum development work between the extremes are usually, on the one hand, of such flexibility that there is virtually no curriculum, and on the other hand, of such rigidity that there is virtually no opportunity to adapt the educational program to the individual. Through all of this the teacher constantly seeks to be "not the first by whom the new is tried, nor yet the last to lay the old aside." The individual has his identity, but at the same time he must live this identity as a cooperative, conforming individual member in the pattern of social-industrial organization. In various phases of the teacher's professional plan, the facts disclosed as a result of continuous occupational analysis, control and give direction to his work.

In developing occupational analyses for educational use, four types of relationships need to be recognized. The first type of relationship is *organization*. By this is meant the structural arrangement through which people carry on the activities of the occupation. Some of the problems which occur in the work of people which can be identified and for which the solutions can be recorded in an organization analysis, are those of definitions of functions, working relationships among members of the personnel, lines of authority, orders and returns, and routine channels. In this initial identification of the four types of relationships to be recognized, graphs in architectural drawing will be used. Later in the article samples in other content fields will be developed illustrating varied applications of the use of these relationships in graphic aids.

Figure 2 indicates a condensed organization chart of architectural staff personnel. Two bases are used, one, relationships in terms of lines of promotion, and the other, relationships in terms of occupational experience travel. Graphs of this type are helpful in guidance and counseling, in planning exploratory experiences, and in planning vocational extension and adjustment educational opportunities. In showing the organization relationship in terms of occupational experience travel, the connection between the organization relationships and the second type of relationship is identified.

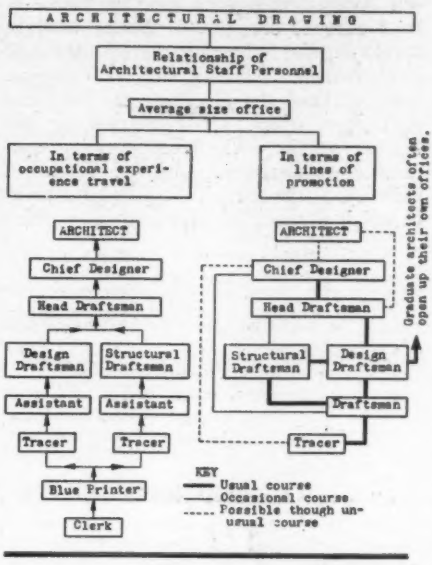

Fig. 2. Courtesy H. W. Schulze, coordinator, industrial education department, La Porte, Ind.

The identification of work and problems resulting from the organization phase of the occupational analysis leads naturally into the second type of relationships to be identified in the occupational analysis. This type may be identified as the *travel or flow* relationship. By this is meant the identification of the flow of material, the sequence of mechanical activities in the production process, or the mechanical channels through which raw material moves to a finished product. Relationships of this type which is also significant in identifying promotion channels or avenues of adjustment within occupation groups. The situation in occupations as defined by travel lines, either of material, processes, or people, is constantly changing. New materials and new constructions make necessary constant adjustments of production channels. Technological change produces new definitions of work with resulting changes in promotion channels.

Figure 3 indicates in condensed form the flow of ideas in producing typical architectural drawings. While revisions and changes may modify the sequence in this flow, as a rule the flow is as indicated.

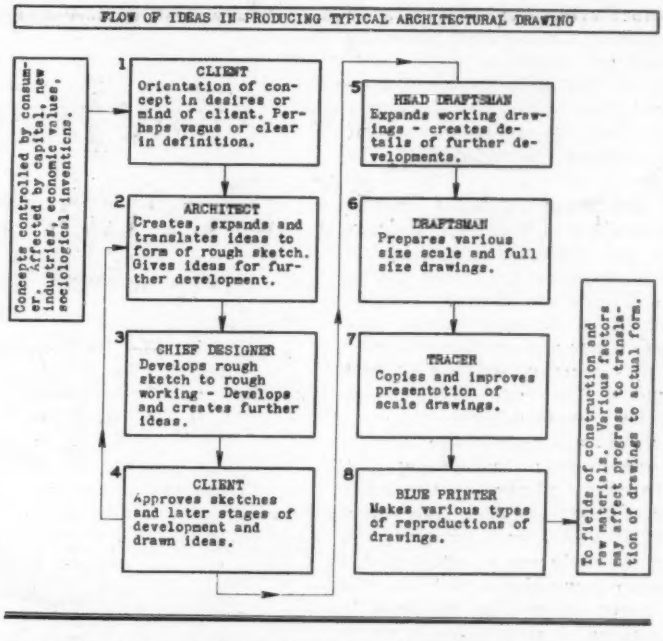
FLOW OF IDEAS IN PRODUCING TYPICAL ARCHITECTURAL DRAWING
Concepts controlled by consumer, affected by capital, new industries, economic value, sociological inventions.
1 CLIENT Orientation of concept in desires or mind of client. Perhaps vague or clear in definition.
2 ARCHITECT Creates, expands and translates ideas to form of rough sketch. Gives ideas for further development.
3 CHIEF DESIGNER Develops rough sketch to rough working - Develops and creates further ideas.
4 CLIENT Approves sketches and later stages of development and drawn ideas.
5 HEAD DRAFTSMAN Expands working drawings - creates details of further developments.
6 DRAFTSMAN Prepares various size scale and full size drawings.
7 TRACER Copies and improves presentation of scale drawings.
8 BLUE PRINTER Makes various types of reproductions of drawings.
To fields of construction and raw materials. Various factors may affect progress to translation of drawings to actual form.

Fig. 3. The numbers 1, 2, 3, 4, 5, 6, 7, and 8, shown above are referred to in Figure 6. Diagram courtesy of H. W. Schulze, coordinator, industrial education department, La Porte, Ind.

With the structural organization of an occupation identified, and with the flow of orders and returns, raw materials and work activities defined, the occupational analysis next calls for the *content* relationship. Content in an occupation may be logically arranged on various bases. It may be arranged in terms of its distribution by people, its occurrence by situations, its classification as mathematics or chemistry, and the like, or in any one of a number of other distributions. Typical problems which arise which call for the use of occupational content analysis serve as direction pointers to help in determining the classifications to be used. Scientific advance results constantly in direct or indirect outcomes which make changes in the fact and skill content of the occupation. The problem of keeping pace with scientific advance, the adjusting of social science to the scientific advances, the adjustments which new technological developments constantly generate, all produce modifications in the technical facts and technical skills making up the content of the occupation. Analysis techniques must identify the technical procedures, the related technical information, the involved materials, and the involved equipment and tools. The results of this analysis of occupational content must be recorded in such a manner as to lend themselves to constant adjustment without disturbance of the plan.

Figure 4 indicates a condensed arrangement in the content of architectural drawing. There are numerous variations in mechanical arrangement to be used in content graphs. The various headings and the relationships to be indicated between one set of classifications and another will vary in terms of the nature of the content analyzed and also in terms of the use to be made of the content analysis.

The fourth type of relationship is probably best identified as the indexing relationship. In many phases of the other three types of relationships, it serves as a supplement. It also serves by itself. In many cases the preliminary sorting of the elements in an occupation is put in index form. In many cases the situations in which the material in occupational analysis would be used are put in index form. Some of the common index combinations are:

Function — mechanical part — make or type of product used.
Time — action — place.
Change — place — result.
Occupational division — product — methods of pattern development.
School — location — course.
Operations — sequences — jobs.

Figure 6 illustrates the use of an index graph to identify change-place-results. Before discussing the implications of Figure 6, however, a brief reference to Figure 5[1] will clarify terminology used in Figure 6. In Figure 6, one of the groups used in developing the index is the group identified as technological change, structural change, and functional change. These are the forms of change which are significant to the teacher in his work in maintaining continuous occupational analysis. Figure 5 indicates at the bottom the four large areas in which changes are produced or in which change has origin in our social-industrial organization. These fields are, of course, interrelated, and in some instances it is impossible to draw a dividing line between them. While change in occupations is usually the result of several developments occurring almost simultaneously, nevertheless, these changes may be identified in large origin areas. The trends in the strength of labor organizations are constant sources of changes in the organization of occupations in industry. New definitions are developed, modifications of craft territory are made, with constant resulting realignments of the structural relationships in the occupation. The trends in private concentration of economic power and control result in redistributions of occupational locations and workers. The functional changes in governmental control bring new alignments in federal occupational definitions. Consumers shift frequently, and with our modern progress in communication, shift quickly on a national basis.

The changes themselves, when analyzed into forms of action, may be grouped as technological change, structural change, and functional change. These are both causes and effects. Technological change is that phase which deals with new tools, new machines, new materials, new processes, new operations, and the like. Structural change is that which deals with the rearrangements and readjustments of the relationships existing between the workers and the occupation. Functional change is that phase which identifies new functions added to the service already rendered to society by the occupation, or the rendering of old functions through new methods or channels. In other words, functional change is the redistribution of social functions from or to the occupation being analyzed or within the occupation.

The orientation of change in the occupational analysis has as its major purpose keeping the analysis up to date, both in accuracy and in completeness. The results of change, therefore, in the upper part of Figure 5 are constant controls in the modification of instructional material. The emphasis in procedures used to record these changes in the occupational analysis, will be governed to a noticeable degree by the uses made of the occupational analysis.

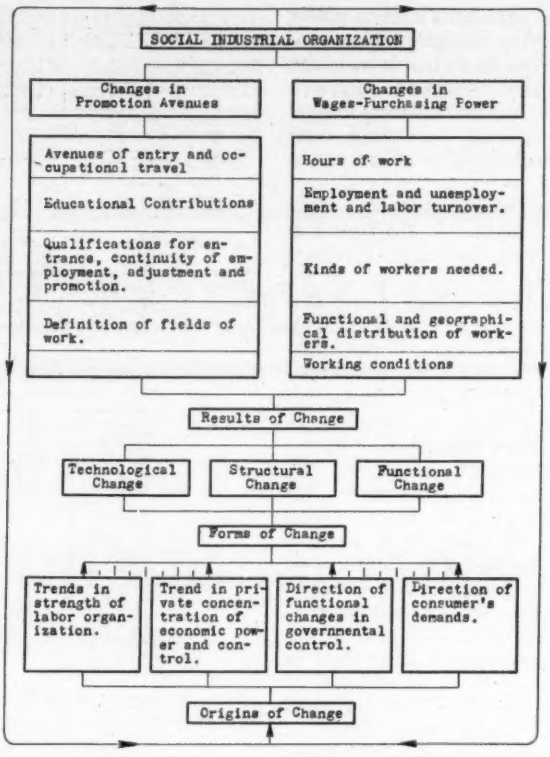
SOCIAL INDUSTRIAL ORGANIZATION
Changes in Promotion Avenues
Changes in Wages-Purchasing Power
Avenues of entry and occupational travel
Educational Contributions
Qualifications for entrance, continuity of employment, adjustment and promotion.
Definition of fields of work.
Hours of work
Employment and unemployment and labor turnover.
Kinds of workers needed.
Functional and geographical distribution of workers.
Working conditions
Results of Change
Technological Change
Structural Change
Functional Change
Forms of Change
Trends in strength of labor organization.
Trend in private concentration of economic power and control.
Direction of functional changes in governmental control.
Direction of consumer's demands.
Origins of Change

Fig. 5. Read up. Adapted from "Social Industrial Education," C. A. Bowman and B. C. Shafer, INDUSTRIAL ARTS AND VOCATION EDUCATION, Nov. 1934

[1] "Social-Industrial Education," C. A. Bowman and B. C. Shafer, November, 1934, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

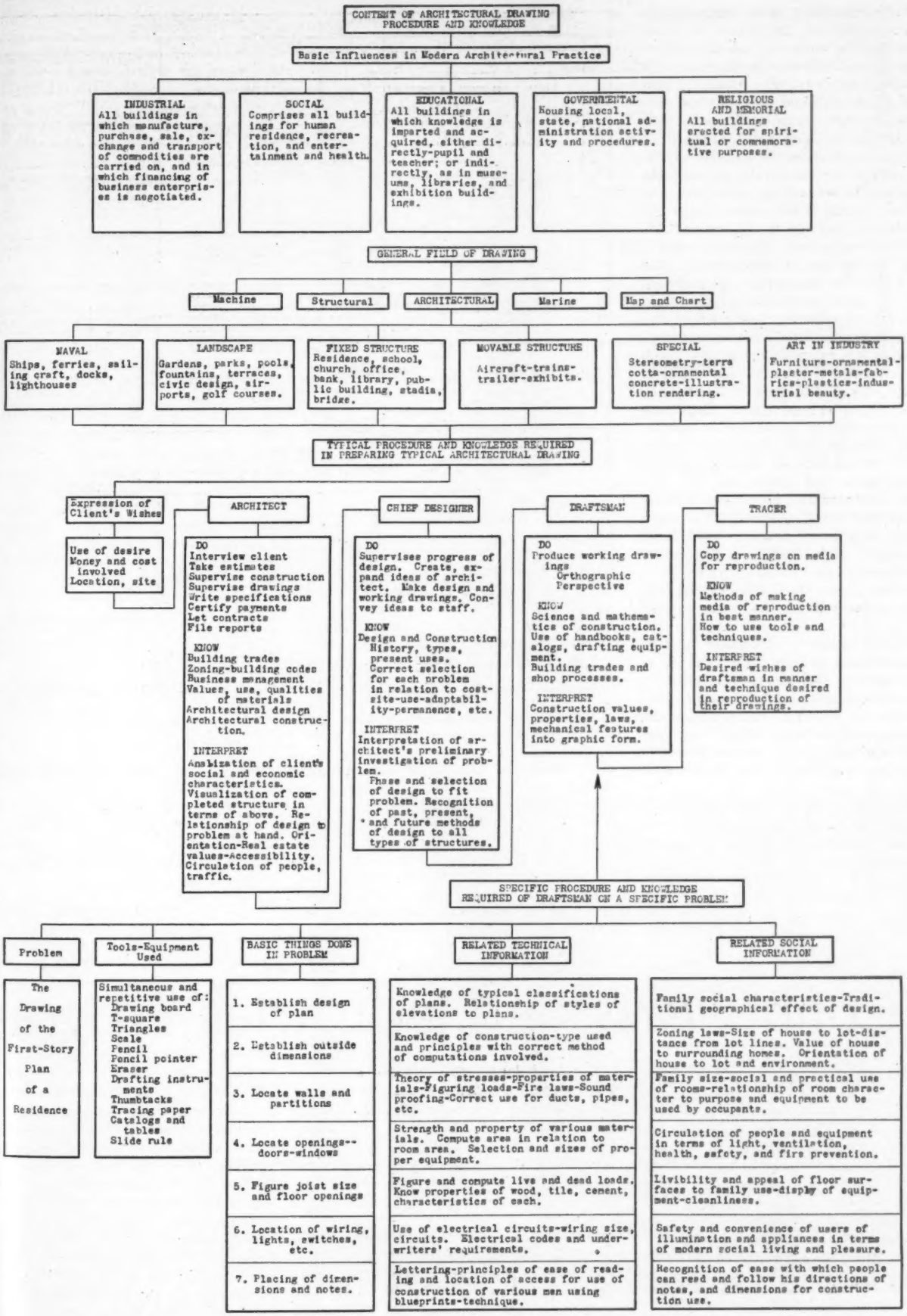
CONTENT OF ARCHITECTURAL DRAWING PROCEDURE AND KNOWLEDGE
Basic Influences in Modern Architectural Practice
INDUSTRIAL
All buildings in which manufacture, purchase, sale, exchange and transport of commodities are carried on, and in which financing of business enterprises is negotiated.
SOCIAL
Comprises all buildings for human residence, recreation, and entertainment and health.
EDUCATIONAL
All buildings in which knowledge is imparted and acquired, either directly-pupil and teacher; or indirectly, as in museums, libraries, and exhibition buildings.
GOVERNMENTAL
Housing local, state, national administration activity and procedures.
RELIGIOUS AND MEMORIAL
All buildings erected for spiritual or commemorative purposes.
GENERAL FIELD OF DRAWING
Machine
Structural
ARCHITECTURAL
Marine
Map and Chart
NAVAL
Ships, ferries, sailing craft, docks, lighthouses
LANDSCAPE
Gardens, parks, pools, fountains, terraces, civic design, airports, golf courses.
FIXED STRUCTURE
Residence, school, church, office, bank, library, public building, stadia, bridge.
MOVABLE STRUCTURE
Aircraft-trains-trailer-exhibits.
SPECIAL
Stereometry-terra cotta-ornamental concrete-illustration rendering.
ART IN INDUSTRY
Furniture-ornamental-plaster-metals-fabrics-plastics-industrial beauty.
TYPICAL PROCEDURE AND KNOWLEDGE REQUIRED IN PREPARING TYPICAL ARCHITECTURAL DRAWING
Expression of Client's Wishes
Use of desire
Money and cost involved
Location, site
ARCHITECT
DO
Interview client
Take estimates
Supervise construction
Supervise drawings
Write specifications
Certify payments
Let contracts
File reports
KNOW
Building trades
Zoning-building codes
Business management
Values, use, qualities of materials
Architectural design
Architectural construction.
INTERPRET
Analization of client's social and economic characteristics.
Visualization of completed structure in terms of above. Relationship of design to problem at hand. Orientation-Real estate values-Accessibility. Circulation of people, traffic.
CHIEF DESIGNER
DO
Supervises progress of design. Create, expand ideas of architect. Make design and working drawings. Convey ideas to staff.
KNOW
Design and Construction History, types, present uses. Correct selection for each problem in relation to cost-site-use-adaptability-permanence, etc.
INTERPRET
Interpretation of architect's preliminary investigation of problem.
Phase and selection of design to fit problem. Recognition of past, present, and future methods of design to all types of structures.
DRAFTSMAN
DO
Produce working drawings
Orthographic
Perspective
KNOW
Science and mathematics of construction. Use of handbooks, catalogs, drafting equipment.
Building trades and shop processes.
INTERPRET
Construction values, properties, laws, mechanical features into graphic form.
TRACER
DO
Copy drawings on media for reproduction.
KNOW
Methods of making media of reproduction in best manner.
How to use tools and techniques.
INTERPRET
Desired wishes of draftsman in manner and technique desired in reproduction of their drawings.
SPECIFIC PROCEDURE AND KNOWLEDGE REQUIRED OF DRAFTSMAN ON A SPECIFIC PROBLEM
Problem
The Drawing of the First-Story Plan of a Residence
Tools-Equipment Used
Simultaneous and repetitive use of:
Drawing board
T-square
Triangles
Scale
Pencil
Pencil pointer
Eraser
Drafting instruments
Thumbtacks
Tracing paper
Catalogs and tables
Slide rule
BASIC THINGS DONE IN PROBLEM
1. Establish design of plan
2. Establish outside dimensions
3. Locate walls and partitions
4. Locate openings--doors-windows
5. Figure joist size and floor openings
6. Location of wiring, lights, switches, etc.
7. Placing of dimensions and notes.
RELATED TECHNICAL INFORMATION
Knowledge of typical classifications of plans. Relationship of styles of elevations to plans.
Knowledge of construction-type used and principles with correct method of computations involved.
Theory of stresses-properties of materials-Figuring loads-Fire laws-Sound proofing-Correct use for ducts, pipes, etc.
Strength and property of various materials. Compute area in relation to room area. Selection and sizes of proper equipment.
Figure and compute live and dead loads. Know properties of wood, tile, cement, characteristics of each.
Use of electrical circuits-wiring size, circuits. Electrical codes and underwriters' requirements.
Lettering-principles of ease of reading and location of access for use of construction of various men using blueprints-technique.
RELATED SOCIAL INFORMATION
Family social characteristics-Traditional geographical effect of design.
Zoning laws-Size of house to lot-distance from lot lines. Value of house to surrounding homes. Orientation of house to lot and environment.
Family size-social and practical use of rooms-relationship of room character to purpose and equipment to be used by occupants.
Circulation of people and equipment in terms of light, ventilation, health, safety, and fire prevention.
Livibility and appeal of floor surfaces to family use-display of equipment-cleanliness.
Safety and convenience of users of illumination and appliances in terms of modern social living and pleasure.
Recognition of ease with which people can read and follow his directions of notes, and dimensions for construction use.

Fig. 4. Courtesy H. W. Schulze, coordinator, industrial education department, High School, La Porte, Ind.

Earlier in this article brief mention was made of several of the types of social agencies making constant use of occupational analyses. Federal, regional, state, and local surveys are constantly producing fact material for educational use. As these surveys are in many cases continuous, their results should be constantly oriented in the occupational analyses affected. These survey results are constantly showing the outcomes of technological, structural, and functional change. They show changes in definitions of fields of work, new qualifications for employment entrance, redefinitions of continuity of employment, and need for help for the workers to maintain adjustment and promotion. They show new avenues of entry into employment and new lines of occupational experience travel. They show new promotion avenues. These surveys frequently uncover new classifications of educational need on the part of workers. Working conditions frequently change very rapidly as a result of technological change. New kinds of workers are often needed in much greater numbers than available. New functional and geographic distributions of workers exercise strong control over employment, unemployment, and labor turnover. Hours of work, wages, and purchasing power are under constant adjustment.

Referring again to Figure 6, we note that the index relationship is set up between the three classifications at the top, technological change, structural change, and functional change, and the three classifications at the left, the organization of the personnel, the travel of ideas, and the content of drawing. The index, therefore, carries nine large areas, each one identified by one of the classifications at the top plus one of the classifications at the left. In each of the nine areas are numbers. For instance, in the area defined by technological changes affecting the organization of personnel (upper left corner), are found numbers 3, 5, 6, and 7. These numbers refer to the same numbers in Figure 3 showing the flow of ideas in producing a typical architectural drawing.

CHANGES AFFECTING THE OCCUPATION OF ARCHITECTURAL DRAFTING

	Technological	Structural	Functional
Affecting the Organization of the Personnel	3, 5, 6 Standardization of constructional treatment in prefabrication means less men to design them in architectural offices.	3 Architectural renderer moved out into own business. Creates help and jobs.	2 Architect expanding services-becomes more of business executive, engineer, sociologist than an artistic individual.
		2 Registration of architects. Decrease of persons permitted to practice. Higher standards of educational requirements.	7 (Decrease of Service) Tracer supplanted by direct drawing on media lending to direct reproduction.
	7 Less use of ink in tracing and use of pencil means less use and need of tracer in office.		3 Architectural renderer goes into separate and own business.
		2, 5, 3, 6 Trend of workers to design and then erect and sell result of design changing organization to business instead of profession.	8 Blueprinting done more and more by speciality firms.
Affecting the Travel of Ideas	4, 5, 6 New methods of reproducing drawings-speed up travel of ideas-into office for changes, out of office into hands of fabricators.	2, 3, 4 Collaboration of staff with new socio-economic agencies send drawings out of office for their consultation-e.i. slum resettlement projects, government projects, civic planning.	5 Organization of draftsmen unions affect time in producing drawings (New York)
	5, 6 Use of mechanical lettering devices (Wrico, etc.) speed up drawings-Scotch tape, staplers for fastening.	1, 3, 6 Frameless steel welded house simplifies drawing design. More welders used-displaced workers redistributed elsewhere.	2 Trend to engineering from design means more study and time to make drawings.
Affecting the Content of Drawing	5 New materials affect and develop new means of indication on drawings-- Structural glass walls Air conditioning equipment Prefabrication of steel house--wood house New illumination schemes. Use of photo electric cell, pre-cast floor joists, wall materials in sheet form. Light weight concrete units for floor and walls-colors integral.	2 Social demands and labor demands affect new concepts of design--cleaner and lighter places of working and living.	2 Collaboration of services bring new ideas to be solved.
		1, 2, 3 Square, flat-roofed home design without cellar affect workers, methods, and materials.	
		2, 3, 5 Buildings becoming more like machines. (Mechanisms functioning for absolutely defined purposes demanded by rearrangements of workers) wider use of accoustical materials increase manufacturers of this product.	3, 5, 6 Functional rearrangement of buildings put new problems into design and drawing.
	2, 3 New materials influence freedom of design from tradition.	1, 2 Values in terms of renters and owners. Resettlement, city planning, safety traffic, parking must be solved. Each problem brings in new method of design for solutions.	

Fig. 6. Courtesy H. W. Schulze, coordinator, industrial education department, High School, La Porte, Ind.

The entries in this area indicate the changes, and the numbers in the area from Figure 3 indicate the location of these changes in the flow of ideas producing typical architectural drawings. This is but one use of the simple index chart. Additional classifications may be used at the right and at the bottom. Additional groupings may be used above or to the left to classify further when such classification is significant.

In the next article graphs showing suggestive arrangements using index relationships will be developed. Sample applications of graphic aids in other content fields will be presented.

(To be continued)

A County Arts and Industries Program

DELMAR W. OLSON*

The Clinton county arts and industries program in Ohio, is now in its fourth year of development. Administered on a county basis, the program was set up simultaneously, in seven rural centralized schools in 1937. In one broad move, a more or less traditional manual-training and manual-arts program was displaced by a modern industrial-arts program in answer to long-felt needs among the local schools and communities. At one time seven laboratories of industries were planned, seven sets of laboratory equipment were purchased and installed, and seven arts and industries programs went into action.

The Need for an Industrial Arts Program

The older practical arts work was comparatively ineffective in aiding boys and girls upon graduation to find themselves in their immediate environment. A few years ago farms absorbed most of these youths upon leaving school. In recent years, however, there has been a very definite shift in the economic significance of farming in the county, due to the growth of manufacturing industries. Centered between Cincinnati, Dayton, Springfield, and Columbus, Clinton County is marked both economically and socially as being within an area of the productive and distributive industries. These facts, coupled with the

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general trends toward mechanization of farming operations, bring about a social-economic complexity which, though not unique in Clinton County, demands the assistance of the schools for solution. In simple words, then, youth needs help in finding himself among the myriad complexities he faces as a member of an ever-changing industrial society.

The problem of making school work interesting and meaningful to pupils is a common one. In a functional program of industrial arts the administrators of the local schools saw an opportunity to make their educational programs more valuable in learning experiences. They realized the possibilities for a close interworking of industrial arts with their academic subjects. They visualized the industrial-arts program as a means for making applicable the teachings of the regular classroom.

Other considerations were involved as well in the planning preceding the initiation of this program. The changing social order in general presents problems in living that need solution. Spending wisely what one earns, consumer literacy, is probably as important in achieving a finer living as is the earning itself. Increasing amounts of leisure time, particularly, present individual as well as social problems.

Finding a job upon graduation from high school is of major concern to most youths. For those to whom college or specialized training is impossible, it seemed that industrial arts can make valuable contributions through vocational guidance, and in instances, specific vocational preparation.

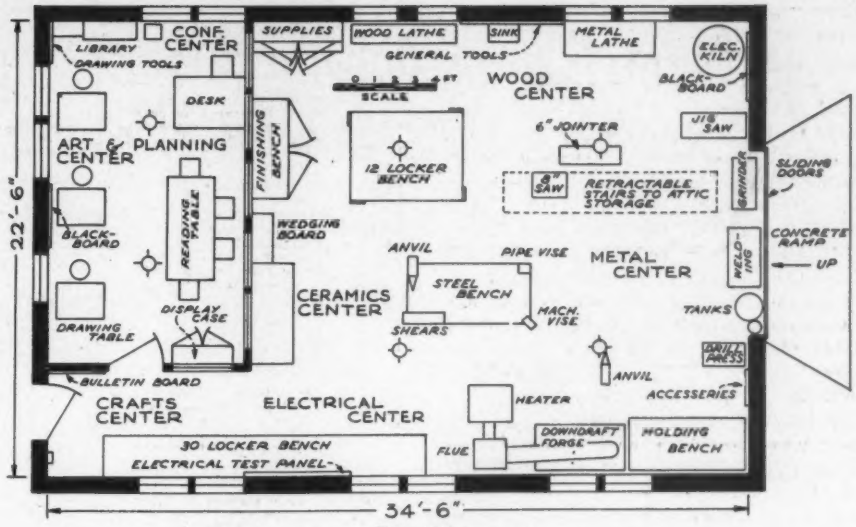
Altogether, then, the Clinton county industrial-arts program was conceived in the light of such needs and purposes as were in evidence among small rural schools with total enrollments of 150 to 350 pupils.

Initiation of the Program

With these definite needs in mind, a committee consisting of the superintendents of the schools concerned and the County Superintendent of Schools, Mr. Carl H. Shanks, visited schools that had already instituted modern arts and industries programs. Ideas were exchanged, authorities were consulted, and with the assistance of Dr. William E. Warner, Ohio State University, and Kenneth W. Brown, now of Ball State Teachers College, laboratory plans were drawn to fit the respective schools.

A county supervisor was appointed to promote the development of the arts and industries program individually as well as collectively. Under his guidance, equipment selections were made, materials purchased, and curriculums organized.

At the present time seven schools have industrial arts on a half-time basis, one instructor serving two schools. A full-time program is being set up in an eighth school this year at Blanchester.



Description

16 pupil laboratory; 40 pupil work stations; 11 motorized machines; ceiling height 9 ft.; windows 3 ft. above floor; wood flooring laid over concrete, 6 in. above gd. line; photographic dark room in basement of main bldg.; attic over entire laboratory; color scheme in buff, green, and brown

The Personnel Involved, 1939–1940

The schools involved and superintendents of the same are as follows: Adams Township School, Mr. R. W. Fenwick, Superintendent; Blanchester School, Mr. Charles H. Williams, Superintendent; Clarksville-Vernon School, Mr. Clifford Camp, Superintendent; Liberty Township School, Mr. D. M. Fadely, Superintendent; Martinsville School, Mr. John L. Gano, Superintendent; Reesville School, Mr. Roy A. Liming, Superintendent; Sabina School, Mr. L. V. Runyan, Superintendent; Wayne Township School, Mr. William Myers, Superintendent.

Teachers in the program are: Kenneth W. McFarland of Miami University; Robert Marsh and Anthony J. Martin of Ohio State University; W. E. Ditzler of Iowa State Teachers College; and Delmar W. Olson, Iowa State College and Ohio State University.

The Subject-Matter Program

The subject-matter program of this development was originally determined on the basis of research largely through the medium of the writer's thesis. Constant usage and experiment since then has proved the worth of the findings and at the same time has disclosed unlimited avenues for

A group problem

I Derivation of Activity Areas, Laboratory Centers, Experience Units from Basic Industrial Arts Subject-matter

Read down	The Drives to Culture as Social-economic Areas of Human Experience						
The drives to culture, to living, as basic subject-matter source All derivations made from them.	Foods	Clothing	Housing	Communication	Transportation	Recreation	Security
Significance to society	Major fields of economic activity as primary source of materials, processes, products, occupations, industries			Fundamental social institutions as Fundamental socializing agencies		Intelligent activity for a "forced leisure"	Social insurance and Social Assurance
Specific subject-matter source	Primary materials as subject-matter: Foods, Textiles, Woods, Ceramics, Metals			Graphic Arts, Communication, Electrical Communication	Transportation	Crafts, Hobbies	Social-economic guidance, Health, Safety, Economic security
Primary activity areas from basic subject-matter	Foods, Textiles, Woods, Ceramics, Metals			Graphic Arts, Electrical Communication	Transportation	Crafts	Guidance, Safety, Personnel mgt.
Basic factors common to all industrial development	Power — A machine is useless without power to drive it			Scientific knowledges and experimental methods — "the heart of industry"			
Translation into activity areas	Power			Related Science		Planning	
Master list of activity areas	1 Foods	2 Textiles	3 Ceramics	4 Woods	5 Metals	6 Power	7 Graphic Arts
	8 Electrical Comm.	9 Transport	10 Related Science	11 Crafts	12 Planning	13 Safety	14 Guidance
	15 Personnel Mgt.						
Analysis for laboratory centers	1 Foods	2 Textiles	3 Ceramics	4 Woods	5 Metals	6 Power	7 Drawing, Arts, Photography, Printing and Publish.
	8 Electrical Comm.	9 Transport	10 Related Science	11 Crafts	12 Planning	13 Safety	14 Conference

Analysis for Experience Units involves study of subject-matter content on basis of materials, processes, products, occupations, industries, for example—

Basic Materials	Foods	Textiles	Woods	Metals	Paper	Leather	Rubber	Stone	Clay	Glass	Chemicals	Minerals	Misc.

Basic industrial means for conversion of materials into products	Mechanical	Electrical	Thermal	Chemical	Hand
Typical analysis for experience units among basic industrial processes applicable to Industrial Arts	Sawing, Burning, Grinding, Reaming, Drilling, Crimping, Turning, Stamping, Shaping, Beading, Spinning, Riveting, Rolling, Bolting, Finishing, Bending, etc.	Magnetizing, Arc welding, Spot welding, Charging, Plating, Conduction, Induction, etc.	Molding, Alloying, Welding, Refining, Brazing, Swedging, Soldering, Shrinking, Heat treating, Forging, Enameling, Melting, etc.	Etching, Plating, Sensitizing, Coloring, Dissolving, Charging, Oxidizing, etc.	Hammering, Sawing, Filing, Chiseling, Planishing, Embossing, Forming, Punching, etc.

pupil activity. The accompanying chart, Diagram I, indicates graphically the source and classification of industrial-arts subject matter as envisioned in the Clinton County program. Largely self-explanatory, it shows a derivation of activity areas and an analysis for laboratory centers based on the cultural drives found in human experiences.

The Drives to Culture as Social-Economic Areas of Human Experience

These are considered as the basic source of subject matter for industrial arts. For purposes of clarification, activity areas are considered areas or units of subject matter; laboratory centers are physical centers drawn from the areas of subject matter and which, taken collectively, make up the actual, physical arts and industries laboratory.

For use in an industrial-arts laboratory extended analysis of the subject-matter areas must be made. This in effect becomes a series of content studies showing generally as well as specifically the vertical and horizontal extents of each activity area. Analysis for content obviously assumes different forms for the 15 areas, since the classification is widely varied. Out of the content studies, then, come details of the story of man's arts and industries, of the development of his material cultures, of his struggle for existence which has led and continues to lead in the direction of a socially desirable way of living. The story is broken down into *experience units* which serve as organized nucleuses for the activity patterns evolved from the pupil's study and work with basic materials, processes, products, industries, and occupations.

Five activity areas have been worked out to a sufficient extent that they are being used in seventh- and eighth-grade classes in the county program. These are: woods, metals, ceramics, textiles, and delineating arts. Already it is evident that through use in the classroom the content study outlines are becoming clothed with detailed applications of pupil-teacher experience. Theoretically, then, it appears at this point that with the experiences had by each class in these fields of subject matter, the content becomes that much richer. The educational worth of the same continues to grow as the content evolves, and in this developing it is impossible for the analysis to become a fixed course of study with fixed values, fixed limits, and fixed potentialities.

A typical Arts and Industries Building in the Clinton County, Ohio program, and located at the Wayne Township School. Formerly housing a farm shop, it was remodelled to fit a modern program of industrial arts. This is the building whose floor plan is shown in an accompanying illustration

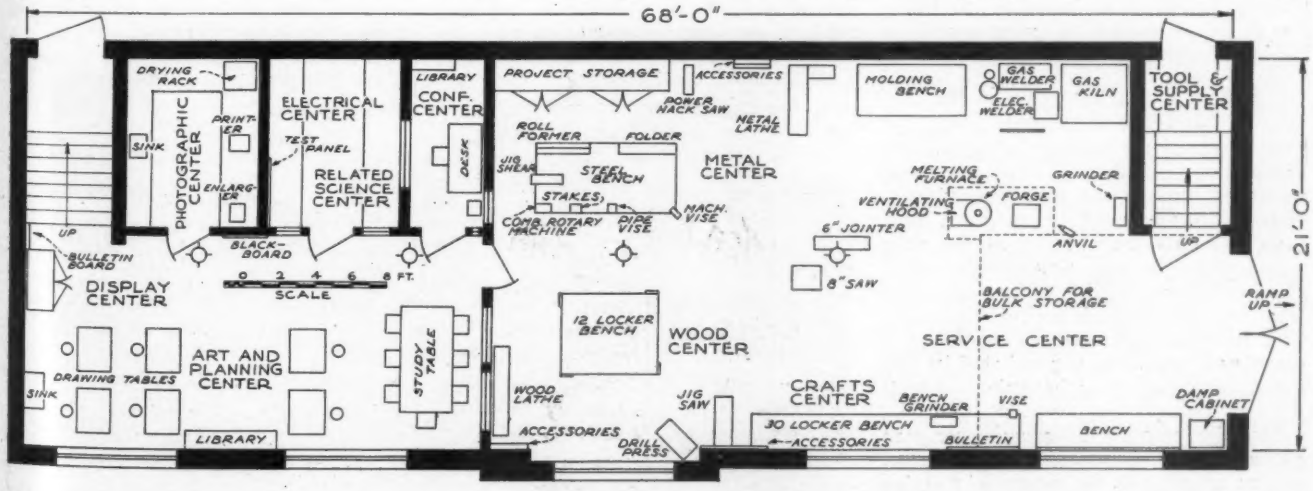
The Laboratory of Arts and Industries

A physical laboratory in keeping with this spread of subject matter is indeed elaborate as compared to the traditional woodworking shop. The cost of equipment on the basis of work stations and the number of pupils served is, however, no more than that entailed in the furnishing of a woodworking shop. The laboratories in this county program involved an average expenditure of $1,500 for physical facilities which permitted a fairly wide selection of equipment. Any one work center is obviously not physically complete for the study of every process involved in a particular material. Instead, it is considered generally complete for the study of basic processes. Since the initiation of the program the laboratories have been growing in facility and changing in appearance. In so far as possible, it is desired to keep them flexible so that changing pupil interests and needs may be better served and at the same time that basic changes in materials, processes, products, industries, and occupations may be provided for.

At the present time the following laboratory centers are fairly complete in physical facilities: ceramics, woods, metals, delineating arts, photography, electrical communication, crafts, planning, and conference.

Significance of Teaching Method

Teaching methods for such a subject-matter program as described herein largely



Description

29 pupil laboratory; 61 pupil work stations, 12 motorized machines; ceiling height varies from 5 ft. to 16 ft.; windows 5 ft. above floor; concrete floor 4 ft. below ground line; color scheme in buff, green, and brown

determine the values being attained. It is readily possible for such an industrial-arts program to become merely glorified manual training or manual arts, if administered under a philosophy which applied to these. Teaching methods in accord with and conducive to the democratic way of living demonstrate the underlying philosophy of the Clinton County program. The democratic element implies varying methods and techniques suitable for the occasion and best in the long run. As a result each pupil is considered an individual in his own right with his interests and potentialities as dominant factors in the guiding of his classroom efforts. Social growth so vital in the democratic way of living develops through the media of the class personnel organization, group planning, and group activity on common problems and projects.

Representative Pupil Activities

With such varied and comprehensive subject matter, it is interesting to note the directions which pupil interests take in the quest for experiences. Metal working has included such opposites as jewelry work and four-wheel trailer construction. Woodwork has shown a selection from buttons to full-sized sail boats. Textiles, from crayonexed napkins to woven rugs.

Ceramics includes study and work in glass, stone, clay, cements, plasters, and the like. Power has run the gamut from toy electric motors to the design and construction of miniature gas engines.

Delineation has included working drawings as well as oil paintings. Photography, the pinhole camera and the photographs for a school annual.

Communication has witnessed the thrill that accompanies the first reception on a crystal set, as well as the construction of short-wave transmitters.

Aviation has shown airplanes from the ten-cent kit to pupil-designed ten-foot flying models.

The story goes on and on in a series of plots and climaxes as varied as the interests of the pupils and the extent permitted by laboratory facilities.

Extent of the Program in the Individual Schools

In seven of the schools industrial arts formally begins with the seventh grade and continues through the high school level. In one, it begins with the fifth grade. Both boys and girls are included in the class membership. In any single high school class, enrollment consists of boys and girls from the ninth through the twelfth grades. This heterogeneous grouping results in a diversity of pupil interests and abilities and keeps instruction from becoming cut-and-dried routine.

Since its inception, opportunity has been provided for adults and out-of-school youths to share in the program. Evening classes are held once a week in each school for two months preceding Christmas. Response has been unusually enthusiastic to these classes with the result that they are now considered a regular part of the curriculum.

The adult classes are strictly informal, with personal needs and interests of prime concern. Students attend as often as they please and work at things they choose. The informality favors sociability which experience shows is a recognized need among rural folk.

In the elementary grades the industrial-arts teacher assumes the role of adviser to the classroom teacher in promoting the development of experience-type programs. There are neither classes nor lessons in industrial arts. Emphasis is placed upon the building of a general elementary educational program through the medium of active, functional experience. The arts and industries laboratory then is available to the youngsters for work in connection with their studies.

Program Advertising

As all enterprises, private or social, are more or less concerned with informing the public in general of the nature of their products or services, so is the Clinton county arts and industries development program. This advertising becomes educating, enlightening in contrast to what is often propagandizing and prejudicing. The sponsors of the program are sold on its merits and freely recommend it to others.

The pros and cons of advertising and publicizing the work of the public school have been scattered through numberless professional journals, with a common conclusion that the means used makes the sale or the sin. Modesty marks the means and makes meaningful the manner in which advertising is used in the county program, as it becomes a definite instrument for creating good will.

Pupil recommendation is the strongest, most powerful advertisement for industrial arts. The adult pupils have knowingly or unknowingly given the program a definite lift. Aside from such involuntary advertising, other methods used include exhibits, displays, contests, news stories, and the like. Annual farmers' institutes in the schools include arts and industries displays as feature attractions. Airplane model shows and contests attract a following. Hobby clubs interest many. Newspapers have been generous with stories and pictures of the laboratories in action.

A most effective means of this type was a series of displays in store windows at the end of the school year, 1938–39. Seven merchants in Wilmington, the county seat, cooperated by allowing the use of their store windows for a week. Seven different displays were set up, one each on the following: metals, woods, ceramics, graphic arts, transportation, communication, and crafts. The theme of these displays was centered about basic materials, processes, and products as industrial-arts subject matter and in relation to living. Public interest was far greater than anticipated in this first county exhibit, with the result that it was adopted as part of the program.

Evaluation and Trends in Development

It is needless to say that such a school program has been on the spot since the first expenditures were made. From the beginning every teacher has been pressed for results indicative of value being received. This impatience logically follows the initiation of an undertaking which discards the old for the new, especially with financial expenditures involved.

At this point in the growth of the program the communities are apparently getting their money's worth even though there are no purely objective means of measuring it. Favorable comment by parents, pupils, superintendents, board members, visitors, school inspectors, and the like, are frequently and freely heard.

In the process of evaluation of an industrial-arts program, there are a number of basic considerations beyond these verbal commendations. The importance of the latter are not to be minimized, however. After all, a pay check is a beautiful thing. These basic considerations as professional criteria may be enumerated:

Looking into the Sabina laboratory

An arts and industries display in a local store window

1. The program should be weighed in accordance with its own purposes and functions, immediate as well as projected.

2. The program should be judged on its contributions to the general pattern of education in the local situation and in the total picture.

3. The program should be considered in the light of pupil change and growth in the direction of well-oriented individuals as well as socially desirable members of a democracy.

Such subjective criteria, simple to enumerate, are decidedly difficult to measure. A reliable score card or rating sheet is a fantasy. Perhaps this is a good thing, for such a weapon in the hands of an amateur could be dangerous. In the last analysis it seems that the only sound means for evaluation of an industrial-arts program on the basis of these criteria lies in the administrators, teachers, pupils, and parents responsible for it. If the local school superintendent, members of the board of education, classroom teachers including the industrial-arts teacher, and the pupils know what their arts and industries program is and what it is for, there remains little doubt but that it will rate well with all concerned. Understanding eliminates prejudice and misconception.

A boy drives a tractor he built onto a four-wheel trailer which he also constructed

Concentrated Industrial Education Prepares Youth

EDWARD W. STLUKA*

When the need for rearming was recognized last spring, the United States was unprepared. Everyone was willing to do his or her share but all too few were vocationally qualified to take their places in vital industry. In the years of peace following the first world conflict, young men and young women had seemed to show a distaste for anything but "white collar" and professional vocational training. These fields were overcrowded and America was deficient in skilled mechanics and machine operators, and industry, receiving momentum from the defense program, was soon demanding mechanics and machine operators by the hundreds.

Something had to be done to meet this demand and, in Wisconsin, the State Board of Vocational and Adult Education, together with the National Youth Administration for Wisconsin, did it. They set up a nine-weeks summer school job experience program in metal trades and allied subjects in 32 vocational schools throughout the state. Students were, of course, young men and young women between the ages of 18 and 25.

Response was immediate and enthusiastic. Hundreds of youth, eager for this vocational education and job experience, applied for admittance to these classes. Applications came even from youth in neighboring states. These applications had to be turned aside as only NYA project workers and other Wisconsin young people could be enrolled in these courses. Those who were finally chosen (of the young men) had the prerequisite of at least some previous metal training. Throughout the entire summer, there was a long list of youth waiting to get into the classes should vacancies occur.

At the Milwaukee Vocational School alone six hundred boys started on this program the first of July. Later some three hundred more were added to bring the total for the school up to 918 enrollees.

Kenosha Vocational School, Kenosha, Wis.

At the Milwaukee Vocational School — the largest of its kind in the United States — the program reached its peak. In order to accommodate the youth, it was necessary to arrange three shifts. The first shift ran from 7:00 a.m. to 2:30 p.m.; the second from 9:30 a.m. to 5:00 p.m.; and the third from 2:30 p.m. to 10:00 p.m. Five hours per day were devoted to shopwork, and two hours to such related work as blueprint reading, mathematics, and shop technology. Every third week the groups changed shifts.

Greatest in demand among the courses were those in the machine shops. Four hundred and twenty young men were divided into three groups; first year, intermediate, and advanced, and the work was arranged in units. As soon as a boy finished a specified number of units satisfactorily, he was given more advanced work. After a period of this advanced work, he was permitted to do work in the large machine shop. Here operations were conducted on a typical factory production basis. Four of the fifty youth in this shop were appointed foremen for a three-day period on a merit basis. In this manner, each youth had a chance to learn something about leadership.

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Racine Vocational School, Racine, Wis.

In the foundry, Milwaukee Vocational School

Spot welding. Racine Vocational School, Racine, Wis.

In this shop, as in all others, the youth obtained actual job experience, with half the time put in by the youth counting as NYA project work for which they were paid by the National Youth Administration. Their instructors, paid at first by the National Youth Administration and later by the U. S. Office of Education, thus became project supervisors, having under their direct supervision the same youth they taught. In this manner it was possible for the instructor to correlate to a fine degree vocational education and job experience.

One of the production projects worked on in the machine shop was the making of 1000 sprinklers for the Milwaukee county park commission. These sprinklers consisted of five parts and were made on a production basis. All types and sizes of vices were made. Faceplates, chucks, tailstocks and lathe heads were machined, the pieces coming from the foundry in the form of rough castings.

Thirty-two youths in the pattern shop were divided into two groups, the intermediate and the advanced.

In the advance shop a new system of teaching was tried with the instructors incorporating the same production conditions found in private industries. The youth foreman placed a job order to be made. After a youth made the pattern, he made a mold of it in the foundry. In this manner, errors made on the pattern were discovered by the maker himself. While instructors were always near at hand and ready to help, the class was run on a cooperative basis.

The fifteen young men in the foundry poured about one-half ton of metal every third day. An electric arc and a gas and coke furnace were used in the melting process. After the second week of school, only a small percentage of the castings had to be recast, so fast did the NYA workers learn.

Four groups of 25 young men each attended the automobile servicing class. There were never less than 10 cars a day on which the youth could work (and the oldest was a 1935 model), and every type of the latest servicing equipment was available to the students. Job experience consisted of overhauling motors, relining brakes and repairing electrical equipment. Looking into this shop, one gets the impression of a large commercial garage.

The number of young men, 32, in the Diesel engine shop equaled that of many factories. These student workers overhauled, repaired, checked up, and maintained 10 Diesel engines of various sizes. The young men, working in groups of four or five, also made tests on fuel oil, crankcase oil, and exhaust oil. In this way, they developed many new ideas which they could incorporate in the important operation of adjusting the injector jets of the engines.

Many articles of sheet metal were made by the 20 NYA boys engaged in this type of job experience. Each youth was given a number of individual tests and problems, and thus was made to feel that he had his own business and was already doing work on a contract basis. They made card holders for the NYA finance department, and photography safe lamps for the NYA photography department. They also made pipes, elbows, and rain gutters for the Milwaukee Vocational School.

Always filled to its quota of 60 youths, with 60 more on the waiting list, was the welding shop. Here the young man really received "concentrated vocational education." During a regular school term, the student had to pay $8.50 for 54 hours of shop. During the summer school program, each youth received free 315 hours of gas and electric welding — the equivalent of two and one-half years of school. It cost the Milwaukee Vocational School $3,000 to run this shop for the summer. Of course, a great deal of welded repair work was done for the school, and a considerable number of new frames and stands were made for various classroom shops.

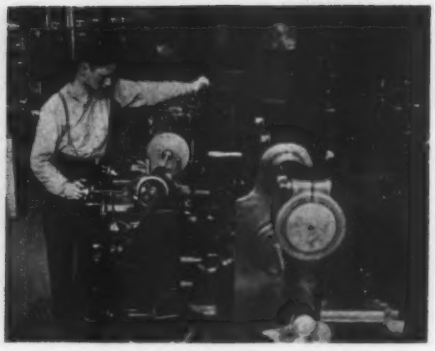
Each youth had to produce a certain number of welds, a specimen of each of which were then sent to the metallurgy class where other student workers made tests and took microphotographs. A written report was then sent back to the young welder so that he could measure his progress and could refer to his microanalysis if he were having trouble making his welds.

The metallurgy class served as the control room for metal used in the production

Rural youth on the National Youth Administration program receive job experience in machine operation, sheet metal work, and welding at the La Crosse Vocational School. The youth reside at the NYA center in La Crosse, Wis.

Milwaukee Vocational School, Milwaukee, Wis.

Milwaukee Vocational School, Milwaukee, Wis.



Manitowoc, Wis.

of shop projects. Twenty-five young men started in the class but this number quickly dropped to 15 as private industry took those who were most advanced. The remaining youths did all the hardening of tool bits made at the school, tested for surface hardness, took heat-refraction tests, tried to find the coefficient of expansion and contraction, and made microphotographs of every tenth piece of metal in process of production in the various shops.

Girls, too, were served by this summer school program. Sixty of them were selected from the NYA sewing project in Milwaukee and were given intensive vocational education and job experience on power sewing machines — buttonhole, hemstitching, two-needle, embroidery, and punch-eyelet machines. Several thousand operating gowns, T binders, and 200 dresses were made for the American Red Cross. Two hundred boys' shirts were made for the Milwaukee county relief department. Emphasis was placed, however, not so much on production as upon training in machine operation.

Interest in this summer school program was widespread. Articles about it appeared in the magazine *Time*, and in local newspapers. Then too there were successful placements in private industry, all of which called attention to the value of the program. The reaction from manufacturers was especially favorable, and many personnel managers of Wisconsin industrial plants visited classroom shops to watch the NYA student workers on the job. The National Youth Administration attempted to give each employer the type of worker he was seeking after fitting the young man or young woman with practical job experience.

The instructors themselves felt well repaid for foregoing their summer vacations, and were enthusiastic in helping to make this program a success. They were especially pleased with the wholehearted response of the youths. John Faville, Jr., Administrator for the Wisconsin National Youth Administration, gives much credit to Director George P. Hambrecht, State Board of Vocational and Adult Education, to the individual vocational schools throughout the state, and to the teaching personnel, in making the program a success.

Faville points out that this is evidenced by the high number of placements. While there is no way of estimating in figures the values these student workers received in job experience, it is believed every one of the 918 enrollees in the Milwaukee Vocational School have found their places in private industry.

While activities at the Milwaukee Vocational School serve as an excellent illustration of the cooperation existing between the National Youth Administration and the State Board of Vocational and Adult Education, this cooperation did not stop with the closing of this summer session. So far, in the regular school season of 1940–41, over 3500 NYA youths have been enrolled in the metal-trades courses in approximately 40 vocational schools throughout Wisconsin. Private industry snaps up "graduates" like proverbial hotcakes, and sometimes, when the need is great, they do not even wait until the youths are deemed "ready."

Core Making, Milwaukee Vocational School

Racine Vocational School, Racine, Wis.

Rural youth get their chance to learn welding at the La Crosse Vocational School under the intense industrial education program of the NYA. The youth reside at the NYA resident center at La Crosse

It is not only the youths who are living in communities which have vocational schools who are benefiting by this program. Young men from outlying rural areas, who are interested in the metal trades, are admitted to NYA resident centers in communities having vocational schools which they can attend. A total of 433 youths are enrolled in work experience centers in Antigo, La Crosse, Marinette, Menomonie, Racine, Rhinelander, River Falls, Superior, and Wausau. Vocational schools in each of these communities act as co-sponsors for the resident centers.

The young men live at these centers and run them on a cooperative basis. They devote 75 hours a month to NYA job experience projects and must attend the vocational schools for at least an equal

number of hours. They receive a monthly wage of $30 from which $15 to $18 a month is deducted for sustenance. In these resident centers, the young men eat, study, and sleep. The atmosphere is not unlike that found in college dormitories.

In connection with the metal trades, but wholly in the field of job experience for young men, the National Youth Administration is planning the construction of a number of production shops throughout Wisconsin. In these shops, the young men will put into practical use the vocational education gained in vocational schools. Lest misconceptions arise. Administrator Faville emphasizes the fact that these shops are neither training centers nor vocational schools.

"We have nothing to do with 'training' as such," says Faville, "that is the function of the United States office of education and the state vocational board. Inadvertently, the word 'training' and the words 'schools,' 'teachers,' etc., are the results of not understanding our program. Our shops are production units, pure and simple, producing for public consumption those things which the city or other public agencies would not otherwise be able to purchase."

Already several of these shops have been constructed and are in use. They are located at Eau Claire, Kaukauna, River Falls, Wausau, and other places. The one at Kaukauna can provide job experiences for as many as 200 NYA youths.

Concentrated vocational education is no longer an experiment — it has proved itself.

Developing Social Consciousness Through Department Unity

H. P. Harshbarger*

Every year, for the past four years, three fourths of the entire student body at Maine Township High School, Des Plaines, Ill., have been enrolled somewhere in the department of industrial and practical arts. This is even more remarkable when it is found that the school is situated in a residential area some 17 miles northwest of Chicago's Loop. The modern million-dollar school building is centered on a 58-acre campus in the open country, 1½ miles from a town.

*Director Dept. of Practical Arts and Superintendent of Adult Evening Activities, Maine Twp. High School, Des Plaines, Ill.

Girls in metalwork

The department of practical arts has developed rapidly during the past few years and now offers over 30 separate classes in 15 distinct areas. The personnel in the department at present consists of 11 full-time instructors. Even though the department policy is that of general education, the various shops are well equipped with a variety of adequate, modern machinery. Full equipment is in use in general woods, general metals, printing, ceramics, crafts, electricity, safety, automobile, sign work, general drafting, house planning and modeling, foods, clothing, art, pottery, and lapidary art.

Contrary to most school systems, the various shops of the department are placed throughout the building on the same level with the general high school offerings. The shops are on the first floor with the commercial and mathematics classes. The drafting, blueprinting, and architectual rooms are on the second floor side by side with the social sciences and English. The homemaking, foods, and clothing are on the third floor with the languages and sciences. The art design unit and kiln is in a fireproof basement room near the agriculture division.

Boys and Girls Elect Rotating Exploratory Units

Seventy-five per cent of the incoming freshmen class each year select the practical arts *finding* courses as their fourth major subject. The boys' course is referred to as *General Industries* and is so arranged that during the 40-week school year, the students will rotate through five eight-week periods devoted to woods, metals, planning, electricity, and printing. The girls' class is labeled *Practical Arts* and gives opportunity for them to explore the following five areas of eight weeks each: house planning, foods, art, clothing, and handicrafts in the first year. In the boys' unit a sixth area is being included by arranging to have the art instructor *float* throughout the five units, giving commercial design instruction where and when needed.

This rotation method in both sections serves two very valuable purposes — that of allowing all teachers involved to meet and know from 100 to 150 freshmen each year in one area. Reversed, it gives opportunity for 100 to 150 freshmen to come in contact and work with six new instructors in their first year of practical-arts experience.

Following the exploratory experience in the first year, students are encouraged to continue in the line of work that appeals to them. They are free to elect any one of the 15 areas in the department and secure either a proficient ability in one or a general, well-rounded industrial education in several.

A "Gift Shoppe" as a Departmental Project

During the school year 1939–40, the department of practical arts chose to sponsor, as a departmental project, the designing and building of a "Gift Shoppe." The idea was conceived through experimentation in connection with the selling of gifts at the annual school carnival. It was decided that a unique, attractive store, well stocked with gift items such as handicrafts, jewelry, small tools, ornamental iron items, wood carvings, plastic pieces, and the like, made in class, would create interest in the departmental activities.

The planning and designing of this new full-size, so-called shoppe was done in the architectural planning classes. The wood classes did the building and carpentry

Fig. 1

work. The metal classes made the reinforcing as well as the outside ornamental ironwork. The electrical classes planned and put in the lighting, both indirect and fluorescent. Sign work was prepared in the sign classes, and the craft classes prepared the interior trim, including plastic display shelves and niches. The homemaking classes studied interior coloring as well as arrangement, and the art classes recommended the exterior color scheme.

This commercial shoppe was made in 12 demountable, portable sections and offered a variety of problems not found in usual house construction. The exterior was furnished by a local lumber company. This firm also provided the newest interior treatments having a variety of designs and color schemes. Red fluorescent plastic provided display shelves inside the windows, while the three indirectly lighted display niches in the back wall provided ample display space.

The house is 16 ft. long, 10 ft. 6 in. high, and about 8 ft. deep. Doors are placed at each end in order that people can pass through the shoppe to make their purchases. A lawn, a fence, a flower box with real flowers, shrubs, shutters, and ornamental outside signs and lights, as shown in Figures 1 and 2 make this one of the most attractive projects ever attempted at the school. Proceeds of gift sales are turned back to defray the cost of the house.

The students in the department experienced all the pride and problems of real, practical construction. The entire school, students and instructors alike, were attracted to the project and daily could be seen watching some phase in the progress of the project.

It has offered untold possibilities for the inculcation of practical and useful educa-

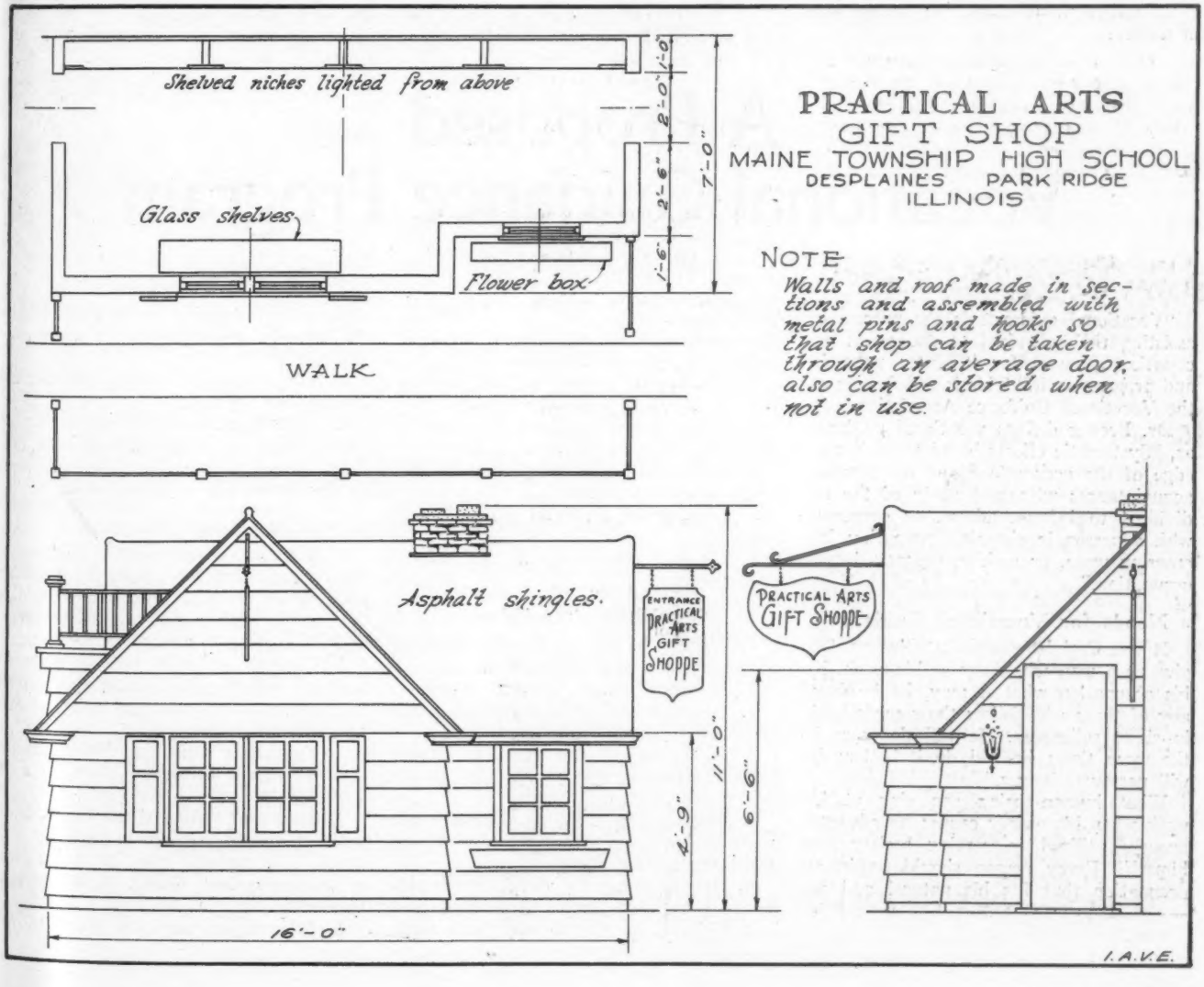
Fig. 2

tion of the most vital kind. It has provided the skeleton for an underlying social consciousness that is so frequently overlooked in modern education.

A Social Consciousness

If a social consciousness does exist at Maine Township High School, and we believe it does, it has been brought about in our estimation through the four following medians:

1. Democratic student participation.



2. Intimate student-teacher associations by congenial instructors.
3. Projects, both individual and group, are merely a means to an end.
4. Stressing of work in its worthiest sense.

The mere fact that 1400 of the 1700 students in the school are enrolled electively in the 15 areas of the departments of practical arts at Maine indicates an appreciation of a truly beneficial service. Genuine human interest on the part of the teachers no longer permits the department to be considered the *dumping grounds*. Every failing student directed to our care, after semester academic tests have been completed, consistently becomes a compliment to the department.

Creativeness, cooperativeness, contentment, and a taste for the richer things in life are developed through departmental activities. It is our constant effort to bring boys and girls together in well-balanced problem-solving situations with a share of success for each and everyone.

Skills alone have caused many a social misfit, but, the objectives of the department of practical arts at the Maine Township High School, aims through its courses to assist in the development of personalities, that can mingle and live contentedly in society.

Paper making in girls' practical arts. W. B. Ashley, instructor

A Proposed Vocational Guidance Program

W. J. DUNNING*

"Vocational guidance is the process of assisting the individual to choose an occupation, prepare for it, enter upon it, and progress in it." This is a definition of the Vocational Guidance Association.

Dr. Brewer defines vocational guidance as, "Systematic efforts based upon knowledge of the occupations and on personal acquaintances with and study of the individual to inform, advise, or cooperate with a person in choosing, preparing for, entering upon, or making progress in his occupation."

Needs for Vocational Guidance

It was Carlyle who said, "Give us, Oh, give us a man who sings at his work. Be his occupation what it may, he is above any of those who follow the same pursuit in silent sullenness. He will do more in the same time; he will do it better; he will persevere longer."

What human being can sing at his work when his energy cannot be advantageously utilized in serving society and himself? Every person should be in an occupation that fits his natural and acquired qualifications and offers the best opportunity for the exercise of his civic and private duties and activities.

The realization of such an ideal is very difficult for the following reasons:

1. Many people in early life hunt a job rather than choose an occupation.
2. Opportunities for vocational self-discovery are not provided.
3. Training for a specific occupation is lacking.
4. The first occupations are not intelligently chosen.

Objectives of Guidance

1. To help the individual make decisions by the exercise of real judgment.
2. To help forecast possible outcomes.
3. To create among the pupils an atmosphere of purposeful activity.
4. To encourage the pupil to extend himself according to his abilities in the field of his choice.
5. Helping him to set up attainable life goals in harmony with his best interests and potentialities.
6. Helping him to develop effective means of working toward these objectives.
7. Helping him to develop such technique of self-direction as shall enable him continuously to adjust in a constantly changing world.
8. Aiding pupils in making effective use of available offerings.
9. Imparting information concerning the opportunities for service through vocations.
10. Giving training for the development of the proper use of leisure time.

Proposed Program

1. A gradual development of the general theory and need for vocational guidance must be set up. The idea must be sold to the faculty, student body, and community or it is doomed to failure.
2. Prepare material for a series of teachers' meetings, informing them about the subject of guidance and securing their sympathetic cooperation.
3. Emphasize guidance during *Education Week, Go to School Week,* or *Find Yourself Day.*
4. Send information about the guidance program to the parents through the students. This material may be in the form of mimeographed sheets, or as printed matter.
5. Information may be given to the

*High School, Canton, Ill.

parents at the regular parent-teacher meetings.

6. Write-ups may be entered in the local paper at various times.

7. The cooperation of local civic organizations should be enlisted.

Appointing Counselors in the Guidance Program

The duties of the head counselor are:

1. To teach the course in occupations.
2. He should know students so that he may know their vocational and educational plans, and follow up their progress while in school.
3. He must keep in touch with irregular attendance, tardiness, and school failures, and make the necessary efforts to improve these conditions.
4. Assist the accelerated pupils to use their time profitably.
5. Remove possible causes for retardation.
6. Know why students drop out of school.
7. Anticipate withdrawals from school in time to prevent them, if possible, and advisable, or to assist the students who should or must leave school in taking the next step in employment.
8. Have charge of scholarship and loan funds.
9. Help the new students make the right start.
10. It is his duty to meet the students at various times.
11. It is his duty to meet the parents singly or in groups at various times, to discuss with them the future prospects of their children.
12. It is his duty to build up a vocational library.
13. It is his duty to organize a proper course in occupations.

The duties of assistant counselors are:

1. To be in close contact with the students and to have group conferences at various times to discuss problems that arise.
2. To cooperate at all times with other teachers and counselors and with the head counselor.
3. To aid pupils in finding material on different vocations.
4. They must help in organizing the various guidance programs.

Qualifications of Counselors:

1. Have a degree.
2. High degree of scholarship.
3. Acquaintance of students.
4. Broad experience.
5. Wide study of occupations.
6. Common sense.
7. He must have a good personality.
8. He must be sympathetic.
9. He must know how and where to get the proper occupational information.
10. He must be a good organizer.

Introduction of an Occupations Course

Students should be inducted into these courses:

1. In the ninth grade.
2. Preferably in the seventh or eighth grade in consolidated or large systems.
3. It should precede programs of vocational training.
4. It should be required of all students.

Plan of Presentation

1. Broad general view of occupational fields:
   - *a*) Agriculture.
   - *b*) Mining and manufacturing.
   - *c*) Transportation.
   - *d*) Building trades.
   - *e*) Machine and related trades.
   - *f*) Homemaking and allied industry.
   - *g*) Commercial.
   - *h*) Professions.
2. Specific occupational groups.
3. Common specific occupations.
4. Special specific occupations.

Functions or an Occupations Course

1. Supplying information and means of obtaining information.
2. Teaching the skills essential in solving vocational guidance problems.
3. Teaching the concepts essential to vocational understanding.
4. Stimulating, encouraging, and developing the power in the student to solve his own problems.
5. Helping the student to establish values — to form some conclusions as to what he should expect and demand from vocational life.
6. Teaching or aiding in the development of attitudes which will facilitate vocational progress.
7. Some familiarity with the actual work done in each occupation.
8. A knowledge of the advantages and disadvantages of a given occupation.
9. How to measure success and to realize satisfaction in vocational adjustment.

Suggested Outline for the Study of Occupations

1. *Conditions of work:*
   - *a*) What are the duties one performs in occupations?
   - *b*) What are the divisions of the separate fields in the occupations?
   - *c*) What is the job in which one usually begins?
   - *d*) What are steps through which one advances to higher positions?
   - *e*) What are the hours of work?
   - *f*) Is the work seasonal?
   - *g*) If so, what are the busy months or the slack months?
   - *h*) Are there any particularly unhealthy features about the work?
   - *i*) Are there any immoral or unethical features?
   - *j*) How many people are engaged in the work?
   - *k*) Is the occupation overcrowded?
   - *l*) Is it likely to grow?
   - *m*) Is it unionized?
   - *n*) What is the best way to get a job in this field?
2. *Requirements:*
   - *a*) How old must one be to enter the occupation?
   - *b*) Are there any special requirements as to height, weight, etc.?
   - *c*) Are any of the special senses particularly involved?
   - *d*) What personal traits are most frequently mentioned in connection with the occupation?
   - *e*) Is the activity involved chiefly mental or physical?
   - *f*) Does it require more than average intelligence?
   - *g*) Is it predominantly social, that is, does it require one to deal largely with people? If so, what class of people?
   - *h*) How much general education is necessary?
   - *i*) What kind of special training is necessary?
   - *j*) How long a time is required for special training?
   - *k*) Where can it be obtained? How much in educational institutions? How much on the job?
   - *l*) How much will the training cost?
3. *Rewards:*
   - *a*) On what basis is the worker paid in this occupation? By the hour, piece or day? How often is the salary paid?
   - *b*) How much can one earn by overtime work?
   - *c*) Is a bonus paid?
   - *d*) How much is the average pay? On a beginner's job? At a later stage of advancement?
   - *e*) How much might one expect to earn after 10 years of service in the occupation?
   - *f*) Are there any special provision for sick benefits, profit sharing, pension, workman's compensation?
   - *g*) How much vacation is given with pay?
   - *h*) What are the chief awards of a nonfinancial nature?

Records of the Individual

Academic:

1. Grades in school through all 12 years.
2. Absences, tardies, and reasons.
3. Promotions or not and reasons.

Health:

1. Physical examination showing defects.
2. Vaccinations, immunizations, and diseases which student has had.

Vocational:

1. Reaction of employers.
2. Success in certain vocations.
3. Failures in certain vocations.
4. Data should continue until student is of age.

Home:

1. Where they live?
2. Married or divorced?
3. Father or mother living or not?
4. Occupation of father or guardian?
5. Nationality of parents?
6. Number of brothers and sisters?
7. Employed or unemployed?

Psychological:
1. Tests.
   a) Aptitude.
   b) Achievement.
   c) Mental.
   d) Adjustment inventory.

Extracurricular activities:
1. School activities.
   a) Success in various activities.
2. Out-of-school activities.
   a) Success.

Placement and follow-up:

Counselor as head of placement and follow-up
1. Instruction in securing employment.
   a) Letter writing.
   b) Personal applications.
2. Watch for openings for employment.
3. Notify students of such openings.
4. Keep in touch with employers by correspondence and visits when possible.
5. Keep in touch with all students; a check of their success in the vocation of their choice.

Conclusion:

In making out this proposed program, a fair-sized school was used as a basis. This program, however, could be applied to almost any size of school with very few modifications. The program requires a head counselor with several assistants, depending upon the number of pupils in the school. In the smaller school systems the principal or superintendent could act as counselor.

This proposed program does not include any tryout or exploratory courses. However, it is worthy of considering the use of supervised correspondence courses and the cooperative plan to provide exploratory experience in instances where the present school program is inadequate in this respect.

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Personnel Service in Industrial Arts

I. M. FENN*

The student must be given information about wages, working conditions, employment opportunities, and possibilities of advancement in the field of his particular qualifications and interests before the time of his choice of specific training for an occupation.

It must be noted that many industrial-arts instructors have had actual experience in varied occupations and as they are familiar with occupational opportunities and employer requirements, they are in an advantageous position to study and assemble this information and make it available to the individual.

It must also be noted that many occupational choices must be deferred; on the professional level they are quite often postponed until after graduation from college. Whether the selection of an occupation, then, is immediate or deferred, or in some cases even the result of some change in the individual's circumstances in adult life, both occupational information and general guidance are essential parts of the entire educative process. Even on a strictly occupational basis this service of guidance to the individual must take into account, not only his abilities and limitations, but his adjustment to his environment as a happy, healthy, and successful citizen.[1]

The "Personnel Service Bulletin" which consists of a series of educational and occupational information loose-leaf sheets was introduced in the first year industrial-arts classes at Tilden Technical High School in 1937. Each week a new bulletin was distributed to the individual student for his personal folder. By the end of the year the individual had in his possession the complete series of personnel service bulletins for future reference. Two, 50-minute periods a week were used for a discussion of the material in the bulletin. After the bulletins were distributed a suggestion was made by the instructor that the individual prepare questions for use in the discussion periods. Those who desired more guidance in the particular topic or occupation being discussed in the current bulletin were given individual attention. It was deemed unnecessary to number the bulletins since they were distributed according to the urgent need for the particular subject.

Bulletins have been prepared for the individual in such a manner as to be very interesting and easily understood. To supplement these bulletins, specialists in business and industry were often invited to talk to the industrial-arts classes on the particular subject of the current bulletin.

Some of the bulletins included in the series which appear in this article are as follows: "Your Health," "School Is Important," "How to Study," "Various Occupations and Fields of Work," "Aviation As a Career."

These bulletins are invaluable in acquainting the individual with the important facts so that he may begin to make a choice of schoolwork which may eventually lead him into an adjusted approach to successful employment. He will be better prepared to face the complex, highly specialized and highly competitive modern business and industrial world.

The industrial-arts instructor should accept the responsibility of organizing and executing the program of occupational information and guidance.

Examples of Bulletins

PERSONNEL SERVICE BULLETIN

OCCUPATIONAL INFORMATION

Your Health

Health Cannot Be Bought

Those who have the good fortune of being healthy seldom fully appreciate it. The poor man is envious of the rich man but the man of wealth would be glad to give up his wealth in exchange for the poor man's good health, perfect digestion, keen appetite, and sound sleep.

Anyone who wants success and long life cannot afford to violate certain laws of good health.

In order to have the blessing of good health, one must learn the art of keeping well.

My Health Plan

I will strive to do the following for my own benefit:

1. To keep myself thoroughly clean.
2. To be careful not to endanger my own health or the health of others.

*Roosevelt High School, Chicago, Ill.

[1] Studebaker, John W., "The New National Occupational Information and Guidance Service," *Occupations*, November, 1938, p. 102.

3. To breathe pure air and to live in the sunlight.
4. To live according to the rules of healthy living.
5. To keep my body healthy and my mind strong by working, resting, and playing at the right time and in the right way.
6. To be an honor to my parents, my friends, and to my country by leading an honest and useful life.

PERSONNEL SERVICE BULLETIN

OCCUPATIONAL INFORMATION

School is Important

Students, do you know how to attain the highest success in a career? You cannot go wrong if you follow these suggestions: first, use the greatest of care in the selection of an occupation; second, make an investigation and a study of all the available information about various occupations.

Are you acquainted with the following information?

1. Many individuals have never attained success because they have been employed on jobs for which they have not been fitted.
2. Those individuals did not take time to consider the occupations for which they were best adapted.
3. They might have saved themselves from disgrace and unhappiness in their positions in society if they had taken the necessary training that would have enabled them to use their talents to the best advantage.

Do you realize:

1. That the school gives you an opportunity to discover your talents?
2. That it attempts to train you in the various subjects to fit you for careers which will best benefit you and society?

Do you also realize:

1. That it has been proved that those students who make good use of their time in school find that they are best suited for their particular field of work?
2. That those who are shiftless and lazy do not discover until too late that school is really worth while?

PERSONNEL SERVICE BULLETIN

EDUCATIONAL INFORMATION

How to Study

Do you know:

That you learn to think when you learn to study?

That you study in order to acquire knowledge and ability to do things?

That in order to be successful in your schoolwork, you should know how to study?

Read Very Carefully the Following Suggestions

1. Always make sure that you know what you are to study and that you understand the problem clearly.
2. Keep in mind the rewards of good work and the results of poor work.
3. When studying do not depend upon others for help unless you find it necessary.
4. Study each lesson each day at a definite time and at a definite place.
5. Study your assignments as soon as possible after you receive them.
6. Begin your studying; develop wholehearted interest in the subject; and guard against daydreaming.
7. Go through the motions of studying and do not stop until you have mastered a definite part of the subject.

Steps in Studying

1. Keep the subject in mind before you begin to study.
2. Read through your assignment to get a general idea of the whole.
3. Read the assignment a second time; outline the lesson; and make note of the important points.
4. Stop at the end of each paragraph and make certain that you have a clear understanding of the paragraph.
5. Difficult parts of the assignment should be read very slowly, thoroughly, and thoughtfully.
6. Study your outline of the lesson and make certain that the knowledge which you have acquired is clear.
7. Be sure to review your lesson before the recitation.

Points to Keep in Mind

1. Always review your old lesson before you begin your new assignment.
2. Use the new knowledge whenever possible in order to retain what you have learned.

PERSONNEL SERVICE BULLETIN

OCCUPATIONAL INFORMATION

Various Occupations and Fields of Work

Students, What Occupation Interests You?

Accountant
Actor
Advertising
Aeronautics
Agriculture
Architect
Army Officer
Artist
Astronomer
Author
Automotive Field
Aviator
Bacteriologist
Baker
Banking
Barber
Biologist
Blacksmith
Broker
Broadcasting Field
Buyer
Cabinetmaker
Carpenter
Chauffeur
Chef
Chemist
Clergyman
Chiropodist
Chiropractor
Commercial Artist
Contractor
Dentist
Detective
Dietitian
Diplomatic Service
Draftsman
Editor
Electrician
Employment Manager
Engraver
Engineer:
- Air Conditioning
- Architectural
- Ceramic
- Chemical
- Civil
- Diesel
- Electrical
- Fire Prevention
- Mechanical
- Radio
- Safety
- Sanitary
- Structural

Farmer
Fireman (City)
Forest Ranger
Geologist
Home Economics
Hotel Managers
Insurance Field
Interior Decorator
Interpreter
Journalism
Lawyer
Librarian
Linotype Operator
Locomotive Engineer
Machinist
Mason
Missionary
Motion Picture Ind.
Motion Picture Opr.
Musician
Navigator
Naval Officer
Nurseryman
Nursing
Oculist
Office Manager
Optician
Orchestra Director
Painter and Decorator
Patternmaker
Pharmacist
Photographer
Physical Director
Physician
Plumber
Policeman
Politics
Post-Office Clerk
Printer
Psychiatrist
Psychologist
Public Health
Publisher
Railroading
Realtor
Reporter
Sales Clerk
Salesman
Sculpture
Secretarial Worker
Shoe Repairman
Sign Painter
Social Worker
Stage Manager
Stationary Engineer
Steam Fitter
Stenographer
Stonecutter
Store Manager
Switchboard Operator
Surgeon
Tailor
Teacher
Telegrapher
Telephone Operator
Traffic Manager
Veterinarian
Welder
X-Ray Technician

PERSONNEL SERVICE BULLETIN

OCCUPATIONAL INFORMATION

Aviation as a Career

The invention of the flying machine and the tremendous strides made by the aviation industry has created a host of occupations among which are the following: pilot and copilot, radio operator, steward and hostess, dispatcher, meteorologist, airplane mechanic, engine mechanic, radio engineer, instrument technician, aircraft and engine engineer, and traffic agent. We shall center our present attention upon that of commercial pilot.

Before being considered for training for commercial pilot, the following personal and mental qualities must be possessed:

1. Steady nerves.
2. Self-confidence.
3. Clear and practical mind.
4. Excellent health.
5. Faultless visual and hearing ability.
6. Above average mechanical ability.

The Training Necessary to Be a Commercial Pilot*

Most commercial pilots are college graduates. They must hold a transport license as well as a Department of Commerce scheduled air transport rating. The requirements for the rating are:

1. 1200 hours of solo flying time.
2. 75 hours night flying experience.
3. Ability to do "blind flying" in all maneuvers.

The transport license may be issued to those who meet the following requirements:

1. Good moral character.
2. Must be a United States citizen or have filed declaration of intention.
3. Must have 200 hours of solo flying, 5 hours of which must have been within the preceding 60 days.
4. Must be able to pass rigid physical examination.
5. Must pass examination on air commerce regulations, engine and plane mechanics, meteorology and navigation.
6. Must pass practical flight tests.

In addition to these requirements, the scheduled airways have special requirements which must be met before employment as a pilot may be obtained. It should not be forgotten that meeting the government requirements does not insure one of a job with a commercial concern. Such matters as skill, responsibility, and general fitness for employment, providing the government regulations are met, is entirely within the control of the company. Therefore many are requiring the successful candidate to be a college graduate.

*The requirements here enumerated may have changed since the lesson was written. They are given merely to show how such regulations may be embodied in the lessons.

PERSONNEL SERVICE BULLETIN
OCCUPATIONAL INFORMATION
Aviation as a Career
Sheet 2

How May Training Be Obtained?

1. The army maintains training schools at Randolph Field and Kelly Field near San Antonio, Texas. The Navy maintains similar schools at Pensacola, Florida. In the Army schools, candidates for training must be within ages 20 to 27, unmarried, have satisfactorily completed two years of college work, and must be of sound physique and in excellent health. There are around 500 entered each year, trained at government expense, paid $75 per month plus $1 per day food allowance, and discharged at the end of 3 years as reserve officers in the Air Corps. Such graduates are then free to seek employment as pilots.

2. There are several registered flying schools in the United States which have been approved by the Department of Commerce. These schools train pilots; the average time required leading to the commercial pilots license being 46 weeks with the average cost to the student being $1,777.

3. There are independently operating instructors at almost every airport who give lessons in piloting a ship. The cost range in such cases is from $5 to $12 per hour.

4. Ground courses including technical work in construction of planes, motors, navigation, etc., may be obtained at some of the colleges and universities as well as a few of the vocational high schools.

The duties of the pilot —

1. To take complete responsibility for and charge of the ships worth from $10,000 to $100,000 as well as from 2 to 25 lives, while making a run.

2. To make routine reports at the end of each trip.

3. To scan the weather maps and draw upon his own sound judgment as to the advisability of continuing a certain course or making emergency landings, etc.

The pilot usually flies a run to some town and brings the next plane back home. He must submit to a physical examination about once each month to determine his fitness for service. Some pilots still active in commercial service are more than 50 years old. The base pay of all pilots in the employ of a company is fixed at a certain sum. It varies from $200 to $250 per month. Those flying regular "runs" receive $600 to $700 per month depending on the type and size of ship flown and also on whether the trip is made at night or day.

PERSONNEL SERVICE BULLETIN
OCCUPATIONAL INFORMATION
Aviation as a Career
Sheet 3

Chances for Promotion —

It is difficult to predict what the aviation industry will be in five or ten years. Men closely associated with the industry feel that the demand for mechanics, pilots, and administrative officers is on the increase. There are two factors which have a strong bearing on the aviation of the future; namely (1) the continued growth of vast networks of air lines, (2) the development of a cheap efficient plane which can be purchased by the people with moderate means. That there is a wide potential market for such planes is strongly felt by Department of Commerce officials. At the present time, all the departments in the field of aeronautics are overcrowded. There are not many opportunities for advancement into the administrative phase of the work. Only a few very superior youths can hope for such advancement.

By writing to the United States Government Printing Office, the following bulletins may be obtained:

Aeronautics Bulletin No. 7A, "Airworthiness Requirements for Aircraft."
Aeronautics Bulletin No. 7B, "School Supplement of Air Commerce Regulations."
Aeronautics Bulletin No. 7D, "Parachute Supplement of Air Commerce Regulations."
Aeronautics Bulletin No. 7F, "Airworthiness Requirements For Aircraft Components and Accessories."
Aeronautics Bulletin No. 7G, "Airworthiness Requirements For Engine and Propellers."
Aeronautics Bulletin No. 7E, "Air Commerce Regulations Governing Scheduled Operation of Interstate Air Line Services."
Aeronautics Bulletin No. 7, "Air Commerce Regulations."
Aeronautics Bulletin No. 2, "Airport Design and Construction."

Vocational Education for the Small Community

DELMER E. EVERETT*

For ages men of the sea have looked from the crow's-nest for a sight of new land, a new land of opportunity where man could apply his efforts toward bigger and better things. The sailor in the crow's-nest has an objective outlook. He is concerned with a spot which is appearing on the horizon. Only on closer inspection and intensive exploration can he determine the true value of his discovery. Possibly his discovery will be the spark which will start a new development or a new trend which may add considerably to man's way of living.

Industrial educators also must climb into the crow's-nest from time to time for an objective view of the things which are appearing on the horizon. Many new opportunities are passing without notice because the teachers are too busy beneath decks of their ship. The field of industrial education is going to expand in many directions; it is the teacher's job to investigate any worth-while growth and assist in its promotion.

Sometime ago a new program of industrial education began to grow in the South. In 1934 this program started; in 1939 there were over 600 of these diversified occupation setups in operation. Think of the increasing opportunities which such a venture brings to the men interested in industrial education. The southern states have done much toward giving this new program greater impetus. Of course, things like these don't "just grow" like "Topsy." There must be a place in the school and community for such a program. Let's look into this field to see if it is needed in the school. Possibly a helping hand is needed in the expansion of the field of industrial education.

The functioning of this program of diversified occupations is relatively simple. A co-ordinator contacts an employer who has a job which offers a possibility for training. A student, preferably from the eleventh or twelfth grade, is selected as a student learner for this occupation. An agreement is made with the employer which guarantees that the student will spend part of his time in school, studying related information, and part of his time on the job, learning the different phases of the occupation. The student is given a trial period to determine the possibility of success in this field of work. The division of time between the school and the job must be so arranged as to insure the scheduling of the subjects necessary for graduation. By selecting students who have completed at least eight credits of work before entering eleventh grade, it is possible to insure graduation with a completion of the necessary courses. Periods of classwork in the related field may be conducted by the co-ordinator and the required subjects may be scheduled under the regular instructor. It is assumed that this combination of related work and occupational experience should develop better workers in many fields. Employers have been highly complimentary in their statements about the merits of this program. Possibly the diversified occupation is an answer to some of the vocational problems of the small industrial community.

There are over 500 different trades and over 25,000 different occupations in the United States. However many of these are represented in your community, and what are you as a teacher of industrial-education doing to provide training in any of these fields? Many maintain that the vocational

(Continued on page 14A)

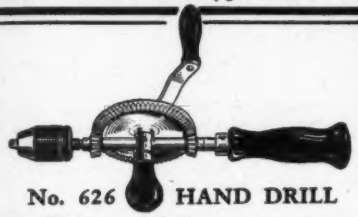
*Part-time co-op department, high school, Rahway, N. J.

No. 52½ 10 oz. HAMMER

"Super-heat-treated" head. "Evertite" oil treated handle of selected straight grain hickory. Patented wedges. Five other sizes.

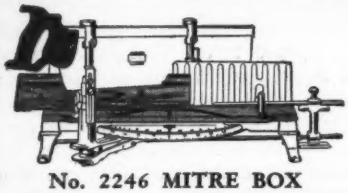
No. R40 "EVERLASTING" CHISEL

No lost or battered handles. Rubber composition handle, practically unbreakable, moulded about shank. Blade, shank and head one piece of finest steel. All sizes: ⅛" to 2".



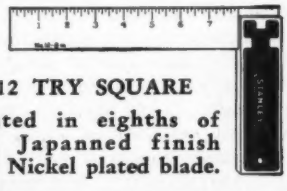
No. 626 HAND DRILL

New chuck with hairpin type springs. Heavy crank, solid wheel, several other important features: ⅜" chuck capacity. Hand drill No. 617 has ¼" chuck capacity.



No. 2246 MITRE BOX

Simplified design. Swivel and uprights one piece of malleable iron. Malleable iron saw guides with roller bearings.

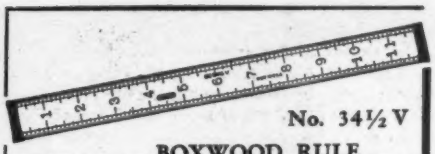


No. 12 TRY SQUARE

Graduated in eighths of inches. Japanned finish handles. Nickel plated blade.

No. 80M SCRAPER

Practically unbreakable. Body and handles one piece of malleable iron.



No. 34½ V

BOXWOOD RULE

Improved vertical figures — easy to read in any position. One side graduated in eighths of inches — other side in sixteenths. Brass tips protect ends.

STANLEY "Boy Proof" TOOLS for School Shops

CATALOG 34 SHOWS TOOLS FOR THESE SHOPS;

WOODWORKING & FARM SHOPS
The most complete line offered by one manufacturer.

ELECTRICAL SHOPS
Hammers, Bit Braces, Bit Extension, Screw Drivers, etc.

SHEET METAL SHOPS
Hammers, Chisels, Punches, etc.

AUTOMOBILE SHOPS
Body and Fender Tools, Hammers, Chisels, Punches, Pliers, Files, Screw Drivers, etc.

MACHINE SHOPS
Hammers, Rules, Chisels, Punches, Levels, etc.

FORGE SHOPS
Anvil Tools, Tongs, Hammers, etc.

WRITE FOR YOUR COPY with School Index

No. 5¼ JUNIOR JACK

Well balanced, lightweight. Ideal size for Junior High School student. 11¼" long. 1¾" cutter.

No. 118 BLOCK PLANE

All steel. Minimum number of parts. Lowest cutting angle.

No. 919 BIT BRACE

Self centering chuck, all parts locked in place. Bronze bushed ball bearing head. Made with 8, 10, 12 and 14 inch sweep.

No. 20 SCREW DRIVER

Standard blade. Blade, shank and head hot forged from one piece of steel.

No. 151M SPOKE SHAVE

Malleable Iron—practically unbreakable. Cutters of finest steel correctly hardened, tempered and sharpened.

TRADE STANLEY MARK

STANLEY ELECTRIC SOLDERING IRONS

No. 340
95 Watts

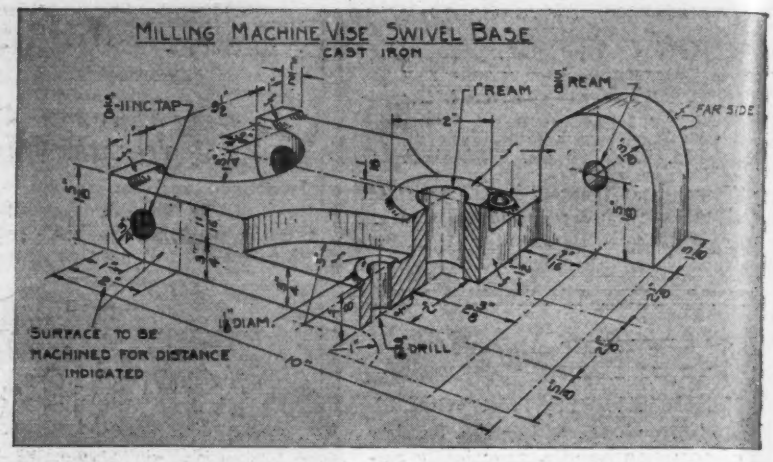
Seven Other Sizes — Wound For Standard Voltages

Quick Heating — even temperature. Replaceable tips. Instant adjustment of handle for length. Hermetically sealed unit. Long life and dependability.

STANLEY TOOLS EDUCATIONAL DEPARTMENT DIVISION OF THE STANLEY WORKS NEW BRITAIN CONNECTICUT

FOR THE REARMAMENT PROGRAM

Here is the first of a series of problems for classroom use designed to aid mechanical drawing instructors and machine shop instructors in the rearmament program. The problem's interest in connection with this program is self-evident. For the convenience of instructors, the makers of Dixon's *Typhonite* Eldorado pencils offer a free blueprint showing the problem's solution.



PROBLEM: **Ask your students to draw the correct orthographic views of this milling machine vise swivel base.**

SOLUTION: **For your convenience Dixon offers a free blueprint showing the problem's solution. Write to address below for blueprint No. 128-J3.**

Dixon's *Typhonite* Eldorado pencils are another aid in your program. In their leads is blended a new form of natural graphite — *Typhonite*. *Typhonite* particles are so minute, even and controlled in size that they make possible leads of unmatched evenness, strength, uniformity and opaqueness — the leads of Dixon's *Typhonite* Eldorado pencils. Prove these facts to yourself by a trial of *Typhonite* Eldorado pencils in your favorite degrees.

SCHOOL BUREAU, JOSEPH DIXON CRUCIBLE COMPANY, ... JERSEY CITY, N. J.

VOCATIONAL EDUCATION FOR THE SMALL COMMUNITY

(Continued from page 140)

departments in the school should shoulder the responsibility for all skilled training. Educators have accepted, in too many cases, the defeatist attitude, that vocational education for the small community is too expensive, consequently nothing can be done. Progressive thinkers cannot justify such an attitude.

Many high schools are predominately college-preparatory institutions. A brief survey will show that a great percentage of the training is never used toward college entrance. Considerable importance is attached to the success of the few who do enter college, but those who do not enter college are simply overlooked. But these, too, must be prepared to enter occupational life. High school students should have the opportunity to get enough credits to enter college and also some training along occupational lines.

Fortunate indeed are the cities which are large enough to provide some form of vocational-industrial education. It is unfortunate that the offerings are so limited. The old traditional trades still hold sway in too many of these vocational schools. Expansion here usually means adding one or two more trades. There should be full speed ahead for this kind of expansion, but a solution to the problem of training for the diversified occupations in our community should also be found.

All indications point to the fact that industry is constantly seeking better employees. Probably some of the smaller shops which are hardly recognized as industrial establishments, offer employment possibilities for many students. Many of these neglected shops may be the direct means of support for some of the graduates of the high school. It appears that many employers would welcome the opportunity to help train some of their prospective employees.

Machinery is becoming highly technical and complicated in nature. New processes and methods are being instituted every day. The small community cannot attempt to render training in the schools which will duplicate that which is practiced in industry. Possibly industry has a duty to perform in helping the schools train for employment.

Great opportunities exist for training in the field of the distributive and service occupations. In fact, this is one of the most fertile places where industrial education may take seed and flourish. Just because this type of training has been neglected in the past, is no reason why it should be neglected in the future. The schools should be instrumental in raising the working standards in the field of the distributive and service occupations. They have been too complacent in feeling that many jobs exist which require no training. It is common knowledge that employers wish to know what job seekers are prepared to do. The school should be able to prepare students to give a definite answer to this question.

Some people may measure the success of a diversified occupation program by the number of students actually working on jobs. Probably this is one indication that industry and business are accepting the program. Naturally, placement is one of the most important phases of a successful program but high placement in itself cannot be used to justify the existence of a diversified occupation department.

Every student learner should have the opportunity to work on a job that offers a learning possibility. If learners are placed in occupations which offer little or no training opportunity, they soon discredit the program. A program of this nature then becomes a *dumping ground* for the school system. The reputation of a sound vocational program should be high: in fact, it should be considered on a par with the best that is offered in the high school.

Exploitation of the student learner must be avoided at all cost. Workers must not be replaced by learners. A student learner is first a learner and second a producer. Training should take precedence over production. If the school permits the lowering of standards, it is contributing toward the downfall of a sound vocational program.

(Continued on page 23A)

Even the best shop instruction is hampered if the tools used aren't high grade. That's why so many experienced vocational and manual training instructors prefer to use Disston hand saws, files, hack saws and other tools in their classes.

With Disston hand saws, for instance, the uniformly sharp and accurately set teeth result in easier, quicker cutting and finer craftsmanship. And these saws, made from tough Disston steel, last longer even in the hands of the beginner.

Also, Disston offers you two special services:

1. Free charts and educational literature for schoolroom use.
2. Disston repairs and refits the saws used as school equipment at nominal cost.

For complete information, write today to Henry Disston & Sons, Inc., Tacony, Philadelphia, Pa.

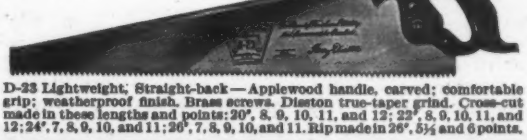
HENRY DISSTON & SONS, INC.
PHILADELPHIA, PA., U.S.A.

THREE POPULAR PATTERNS OF DISSTON HAND SAWS

D-8 Lightweight, Skew-back—High polish. Applewood handle, with new weatherproof finish. Brass screws. Disston true-taper grind. Made in 26" lengths only, 7, 8, 9, 10, and 11 points cross-cut. Rip, 26", 5½ and 6 points. Differs from D-8 Regular Pattern in width of blade only.

Regular Pattern. Cross-cut: 20", 8, 10, and 12 points; 22", 8, 10, and 12 points; 24", 7, 8, 9, 10, and 11 points; 26", 5, 6, 7, 8, 9, 10, and 11 points. Rip made 22", 7 point; 24", 6 and 7 points; 26", 5, 5½, and 6 points.

D-7 Lightweight, Straight-back, Beechwood handle, weatherproof finish; brass screws. High polish. Disston true-taper grind. Made in 26" length only. Cross-cut, 7, 8, 9, 10, and 11 points. Rip, 26", 5½ and 6 points. Made also in Regular Pattern—20, 22, 24, 26" lengths.



D-23 Lightweight, Straight-back—Applewood handle, carved; comfortable grip; weatherproof finish. Brass screws. Disston true-taper grind. Cross-cut made in these lengths and points: 20", 8, 9, 10, 11, and 12; 22", 8, 9, 10, 11, and 12; 24", 7, 8, 9, 10, and 11; 26", 7, 8, 9, 10, and 11. Rip made in 26", 5½ and 6 points.

DISSTON

Woodworking Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

Bench
- *a*) Shop, with hardwood tops, 1¾ in. or over in thickness, built up of strips with tongue-and-groove joints, the top to project far enough to allow a rapid-acting or continuous-screw vise to be attached.
  It is a good idea to order a 1-in. birch or maple board wide enough to cover the working face of the bench at the time of buying the benches. This board can then be fastened to the top proper with screws and may be conveniently replaced when worn. The benches should be made of thoroughly kiln-dried lumber throughout. They may be either plain or of 6-drawer type.
- *b*) Glue
- *c*) Stain, with metal-covered top
- *d*) Teacher's demonstration

Blackboard — permanent or portable

Bookcase

Bulletin Board

Cabinets — wood or metal for filing class records, instruction sheets, drawings, etc.

Chairs — teacher's and tablet-arm

Core Oven — for patternmaking class

Desk — teacher's, with drawer compartments

Furnace — for melting soft metals (for patternmaking class)

Glue Pot — 1-qt. or 2-qt. electric, gas, or steam heat

Glue Warmer or Cooker — 1- to 5-gal. capacity

Grinder
- *a*) Automatic knife, direct-motor-drive type. Size to suit largest knife used in school shop, complete with water pump, grinding wheel, and automatic stops
- *b*) Bench, hand or power
- *c*) Bench, motor-in-head. Motor bearings to be completely housed, wheels to be equipped with safety flanges and carefully guarded throughout. One fine-grit, and one coarse-grit wheel
- *d*) Revolving oilstone, pedestal type, with one fine and one coarse oilstone

Jointer
- *a*) 6-in. or 8-in. portable jointer. Table to be fitted for rabbeting. Safety-cylinder type, equipped with safety guard
- *b*) 12-in., 16-in., or 18-in. direct-motor-drive, ball-bearing. Cylinder to be of safety-head type. Table to be fitted for rabbeting. Jointer to be equipped with safety guard

Lantern — Stereopticon-view machine for opaque objects and standard-type lantern slides

Lathes
- *a*) 6-in. to 16-in. motor-in-head, motor-in-base, or belt-driven speed lathe, to take 24 in., 36 in., 48 in., 60 in., or 72 in. between centers. Each to be complete with cup center, spur center, faceplate, rosette chuck, tool rests, and center drift for head block
- *b*) Patternmakers', with end faceplate provision. Lathe to be of direct-motor-drive type, equipped with variable-speed motor, faceplates and floor stand. (For patternmaking class)

Mortiser
- *a*) Direct-motor-drive, or belt-driven, hollow-chisel mortiser, foot feed. Table to be of the tilting type with hold-down clamps and stop rod
- *b*) Portable, vertical, hollow-chisel mortiser, bench type

Planer — 12-in., 18-in., 20-in., 24-in., or 30-in. motor or belt-driven, single-surface planer. Safety-head cylinder, three-knife type, fitted with good-grade steel knives. Knife-setting and jointing device complete with bar should be mounted on machine if possible

Sander
- *a*) Belt, direct-motor-drive
- *b*) Disk, motor or belt-driven
- *c*) Oscillating-spindle, motor-driven
- *d*) Portable, hand-plane type, direct motor drive
- *e*) Vertical-spindle and disk sander

Saws
- *a*) Band saw, 20-in. to 36-in., motor drive. Upper and lower wheels to be completely guarded. Table to tilt to 45 deg.
- *b*) Combination, band saw, crosscut saw, ripsaw, and mortiser. Machine to be completely guarded
- *c*) Cut-off, pedestal or swing type to be fitted with 12-in. to 16-in. saw
- *d*) Filing machine, direct motor drive
- *e*) Jig, direct-motor or belt driven
- *f*) Portable band saw, 16 in. to 20 in. ball-bearing, motor-driven
- *g*) Saw bench, direct connected to motor, and to have both rip and crosscut saws. Rip and crosscut gauges also to be provided
- *h*) Universal saw bench, 14 in. to 16 in., motor driven
- *j*) Variety saw bench, motor driven, tilting table, with universal sliding table. The arbor is to be fitted for a dado head, and the table is to be slotted accordingly. The saw is to be equipped with ripping fence and miter cut-off gauges

Shaper
- *a*) Motor drive, single or double spindle. Table to be equipped with removable center plate
- *b*) Portable shaper or router with a suitable selection of cutters

Tenoner — single end, with coping heads and cut-off saw

Vises — rapid-acting or solid-nut type woodworking-bench vises, 7-in. to 10-in. face

Wood Trimmers — complete with all gauges and taper pins. Base of trimmer to be slotted and laid out for degree settings (for patternmaking class)

Woodworking—Small Tools

Awls — brad, assorted sizes

Bevels
- *a*) Protractor
- *b*) Sliding T, 8 in.

Bits
- *a*) Auger, 3/16 in. to 1 in. inclusive, by 16ths
- *b*) Auger, 3/16 in. to ½ in. inclusive, by 16ths
- *c*) Braces, ratchet-type, 8 in., 10 in., 12 in., or 14 in. sweep
- *d*) Countersink, for wood, rose pattern, ½ in. and ⅝ in.
- *e*) Dowel, square shank, ¼ in., 5/16 in., ⅜ in., ½ in., ¾ in.
- *f*) Expansive, ⅞ in. to 1½ in.
- *g*) Expansive, ⅞ in. to 3 in.
- *h*) Forstner, square shank, ¼ in. to ½ in. inclusive, by 16ths
- *i*) Screw driver, square shank, ¼ in., 5/16 in., ⅜ in.
- *k*) Twist drill for wood, square shank, 1/16 in. to ⅜ in. inclusive, by 16ths
- *l*) Twist drill, straight shank, 1/16 in. to ⅜ in., inclusive, by 32nds

Blowtorch

Brooms

Brushes
- *a*) Bench duster, 10 in.
- *b*) Floor
- *c*) Glue, round, 1½ in. and ¾ in.
- *d*) Glue, round, 1½ in.
- *e*) Marking, camel's-hair, No. 1 and No. 2
- *f*) Varnish, flowing, 2 in. and 2½ in.
- *g*) Varnish, flat, ½ in., ¾ in., and 1 in.

Burnishers — oval or round

Can Opener

Carving Tools
- *a*) Sets containing 6 tools
- *b*) Sets containing 12 tools

Chisels
- *a*) Cold, machinists', ⅜ in. and ½ in.
- *b*) Mortising chisel and bits, ¼ in. to ⅝ in. by 16ths
- *c*) Socket-firmer, bevel edge, ⅛ in., ¼ in., ½ in., ¾ in., 1 in., and 1½ in.
- *d*) Socket-firmer, plain edge, ½ in., ¾ in., and 1 in.
- *e*) Tanged-firmer, bevel edge, ⅛ in., ¼ in., ½ in., ¾ in., 1 in., and 1¼ in.

Clamps
- *a*) Bar, 24 in., 36 in., 48 in., and 60 in.
- *b*) Hand-screw, 4 in., 5 in., 6 in., 7 in., 8 in., 10 in., 12 in., and 14 in.
- *c*) Malleable-iron C, 4 in., 6 in., and 8 in.

Dividers — wing, 6 in. and 10 in.

Dowel Plate — 6 in. long

Doweling Jigs — with bushings

Drawknives — 7 in.

Drill
- *a*) Automatic hand, with 8 drill points
- *b*) Chuck, 0 to ⅜ in.
- *c*) Hand, 0 to ⅜ in., for round-shank drills
- *d*) Star, for concrete, ½ in. and ¾ in.

Files
- *a*) Auger bit, assorted, 6 in.
- *b*) Cabinet, 8 in. and 10 in.
- *c*) Card and brush
- *d*) Flat, wood, 10 in.
- *e*) Mill, bastard cut, 10 in.
- *f*) Round, bastard cut, 12 in.
- *g*) Taper, slim, 5½ in. and 7 in.

First-Aid Cabinet and Supplies

Gauges
- *a*) Bit, adjustable
- *b*) Jointer
- *c*) Marking, metal or hardwood
- *d*) Mortise, metal or hardwood
- *e*) Panel

Glass Cutter

(Continued on page 20A)

Meet Today's Training Crisis

New Low-Cost Delta Machines enable Schools to train Students on same Tools that Industry Uses

In every phase of American manufacturing, including many plants engaged in national defense work—batteries of Delta drill presses, grinders, saws, shapers, cut-off machines, abrasive finishing machines and other Delta machines—are playing an increasingly important part in breaking "bottlenecks" and stepping up production. American Industry has been quick to see the many advantages of Delta machines—their low first cost, their low cost of operation and maintenance, their remarkable flexibility, adaptability and efficiency.

As a result of the amazing penetration of Delta Machines into industry—these same tools are now widely used in trade schools, "refresher" courses, school farm shops, special preparatory courses, N.Y.A. training—and many schools offering vocational training for National Defense. Check into the complete story of Delta machines and see how they can aid in your vocational training program.

Batteries of Delta drill presses in operation at Eclipse Aviation, a Division of the Bendix Corporation.

Kearney & Trecker, Milwaukee, use 17" Delta drill presses for all their accurate drilling operations.

Many hundreds of school shops have installed Delta machines for industrial training.

A Complete Series of Operating Manuals

To aid in the more efficient operation and maintenance of Delta Machines—we have issued a series of operating manuals covering all major tools used in school woodworking shops.

This series includes books on "Circular Saw and Jointer", "Lathe" (including woodturning, metal turning and spinning), "Shaper", "Band Saw and Scroll Saw", "Drill Press" (for both wood and metal), "Abrasive Tools"—each of which list at 25c—and "Practical Finishing" which lists at 50c. All books are of uniform size, 6" x 9", paper covered and contain numerous illustrations and valuable information. Several universities and schools have considered the up-to-the-minute material in these operating manuals so comprehensive and authentic that they have requested, and been granted, permission for its use in part or whole in shop equipment text books.

GETTING THE MOST OUT OF YOUR BAND SAW AND SCROLL SAW
GETTING THE MOST OUT OF YOUR ABRASIVE TOOLS
GETTING THE MOST OUT OF YOUR LATHE
GETTING THE MOST OUT OF YOUR SHAPER
GETTING THE MOST OUT OF YOUR CIRCULAR SAW AND JOINTER

SEND FOR SHOP LAYOUT BOOK

Prepared by vocational instructors from all over the country—the shop layouts and photographs contained in this new book are authentic school shop installations embodying the most ingenious solutions of the problems of space, safety, lighting, convenience and teaching efficiency in both small and large schools. There are actual floor plans and photographs of 30 shops in this attractive 44 page book.

In addition, this new book for the first time makes available important information on the new type of industrial power tools that are being so rapidly adopted for school use. Each tool is listed individually—and instructions for the placing and most efficient use of each tool are given.

Every one interested in vocational instruction should have a copy—and its yours —FREE.

The DELTA MFG. CO.

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THE DELTA MANUFACTURING COMPANY (E341)
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☐ Please send me FREE copy of "How to Plan a School Workshop" and latest Catalog of Delta Tools.
☐ I enclose $....., for which send me postpaid .....copies of following operating manuals.

.....

.....

Name .....
Address .....
City ..... State.....

(Continued from page 16A)

Gouges
- *a)* Tanged-firmer, outside ground, handled, ⅛ in., ¼ in., ½ in., ¾ in., 1 in.
- *b)* Tanged-firmer, inside ground, handled, ⅛ in., ¼ in., ½ in., ¾ in., 1 in.
- *c)* Spoon, ½ in., ¾ in., and 1 in.

Hammers — claw, bell-faced, 10-oz., 12-oz., 13-oz., 16-oz.
Hatchet — bench, 4 in. cut
Jars — earthenware, 1-qt. capacity
Knives
- *a)* Jointer, to fit power machine
- *b)* Planer, to fit power machine
- *c)* Sloyd, 3 in. blade

Levels
- *a)* Wood, 24 in.
- *b)* Machinists', 12 in.

Mallets — hickory, 3 in. by 5 in. head
Nail Sets — 1/16 in. and 3/32 in. points
Oilers — bench, 1/3-pt. coppered, best grade
Oilstones
- *a)* 1 in. x 2 in. x 8 in. in iron box
- *b)* Gouge slip, medium, 4½ in. x 2⅛ in. x ⅝ in. x 5/16 in.
- *c)* Gouge slip, fine, 3 in. x 2 in. x ⅜ in. x ⅛ in.

Pincers — 6 in. carpenters'
Pinch Dogs — ¾ in., 1 in., and 1¼ in.
Planes
- *a)* Block, adjustable, 6 in. long, 1⅝ in. cutter
- *b)* Circular
- *c)* Combination, adjustable
- *d)* Core box
- *e)* Duplex, fillister and rabbet
- *f)* Fore, ⅛ in., 2⅜ in. cutter
- *g)* Irons, double
- *h)* Jack, 14 in., 2 in. cutter
- *j)* Jointer, 24 in.
- *k)* Round, wood, 1¾ in.
- *l)* Router
- *m)* Smooth, 9 in., 1¾ in. or 2 in. cutter

Pliers
- *a)* Round-nose, 5 in.
- *b)* Side-cutting, 6 in.

Putty Knives
Rasps — half round, wood, 10 in.
Rules
- *a)* Board
- *b)* 1 ft. or 2 ft. graduated by 8ths and 16ths
- *c)* Shrink, ⅛ in., 3/16 in.

Saws
- *a)* Back, 12 in., 14-point
- *b)* Band, ¼ in., ½ in., ¾ in., to fit power machine
- *c)* Compass, 10 in.
- *d)* Coping, frames
- *e)* Coping, blades
- *f)* Crosscut, 9-tooth, 22 in. long
- *g)* Crosscut, circular for power machine
- *h)* Dado, ⅛ in. to 1 1/16 in. to fit power-saw arbor
- *j)* Hack, frames, 8 in. or adjustable
- *k)* Hack, blades, 8 in.
- *l)* Keyhole, 10 in., 10-point
- *m)* Rip, 7-point, 22 in. long
- *n)* Rip, circular for power machine
- *o)* Set, 10 points per inch and finer
- *p)* Set, 10 points per inch and coarser
- *q)* Turning frame, 14 in.
- *r)* Turning blades, 3/16 in. x 12 in., 10-tooth
- *s)* Miter-box, 24 in. x 4 in. saw, 7 in. capacity at miter

Scrapers
- *a)* Cabinet
- *b)* Glue, triangular
- *c)* Veneer, blade 2¾ in. long, handle 11 in. long

Screw Drivers
- *a)* Cabinetmakers', 4 in., 6 in., and 8 in.
- *b)* Quick-return, spiral ratchet

Shoot Board — and plane
Snips — tinners', forged steel, 2½ in. cut
Spokeshaves — adjustable, raised handle, 10 in. long
Squares
- *a)* Combination, 12 in.
- *b)* Try-, iron handle, 8 in.
- *c)* Framing, 2 ft.

Steel Figures — hand cut, ⅛ in.
Tapeline — 50 ft. steel
Trammel Points — adjustable metal frame, steel points
Turning Tools (for 12 lathes)
- *a)* Calipers, 6 in. inside and outside
- *b)* Calipers, 12 in. inside and outside
- *c)* Parting tools, ⅛ in.
- *d)* Round point, ¼ in., ½ in., ¾ in.
- *e)* Spear point, ¼ in., ½ in., ¾ in.
- *f)* Square point, ¼ in., ½ in., ¾ in.
- *g)* Turning chisels, ¼ in., ½ in., ¾ in.
- *h)* Turning gouges, ¼ in., ½ in., ¾ in.
- *j)* Turning skews, L.H., ¼ in., ½ in., ¾ in.
- *k)* Turning skews, R.H., ¼ in., ½ in.

Vise — 3 in. jaw anvil face
Wrenches
- *a)* Adjustable, 8 in., 10 in., and 12 in.
- *b)* Headless setscrew, ¼ in. to ⅝ in. by 16ths
- *c)* Pipe, 10 in. and 12 in.
- *d)* S-type or open-end type to fit ⅛ in. to 1 in. U.S.S. nuts

Woodworking—Materials and Supplies

Alcohol
Benzine
Brads — ⅛ in., ½ in., and ⅝ in. No. 20; ¾ in. and ⅞ in. No. 10; 1 in. No. 18; 1¼ in., and 1½ in. No. 16; 1¾ in. No. 15; 2 in. and 2½ in. No. 14
Carbon Paper — black
Colors — dry: burnt sienna, burnt umber, cobalt blue, chrome yellow, drop black, lamp black, Prussian blue, raw umber, Van Dyke brown, and vermilion
Colors — ground, in oil or japan: burnt sienna, burnt umber, cobalt blue, chrome yellow, drop black, lamp black, Prussian blue, raw umber, rose lake, Van Dyke brown, and vermilion
Decalcomania Transfers
Dowel Pins and Plates
Dowels: hardwood, 3-ft. lengths, ¼ in., 5/16 in., ⅜ in., ½ in., ¾ in.
Enamel
- *a)* Selected colors
- *b)* Undercoater

Fillers — paste: natural, golden oak, dark oak, and mahogany
Fillets — leather, ¼ in. and ½ in.
Glue
- *a)* Casein, hide, best grade cabinet
- *b)* Liquid

Hardware: Brackets, buttons, butts, casters, catches, chain, chest corners, chest trimmings, corner braces, corner irons, corner plates, desk fittings, door fittings, escutcheons, fasteners, handles, hangers, hinges, hasps, holders, hooks, knobs, latches, lamp fittings, lid supports, locks, pulls, smoking-stand outfits, springs, stops, supports
Hooks
- *a)* And eyes
- *b)* Cup
- *c)* Screw and
- *d)* Square screw

Lacquer — black, clear, cobalt blue, ivory, medium green, red, thinner, white and yellow
Lumber — Ash, balsa, bass, birch, cherry, cypress, locust, mahogany, maple, oak, poplar, red cedar, red gum, redwood, sap gum, yellow pine, walnut, white pine
In ordering pine, mill-run kiln-dried will be found suitable for carpentry, while short, select, kiln-dried 4 in. and wider or No. 1 shop common, kiln-dried will be required for cabinetmaking and patternmaking
Hardwood, for furniture, should be specified first and second grade, kiln-dried, standard widths and lengths, or short lengths
Moldings
Nails
- *a)* Common, 6d, 8d, and 10d
- *b)* Flat-head, ½ in. No. 20, ¾ in. No. 19, 1 in. No. 18, 1¼ in. and 1½ in. No. 16, and 2 in. No. 14
- *c)* Finishing, 4d, 6d, and 8d

Oil
- *a)* Linseed, boiled
- *b)* Linseed, raw
- *c)* Machine
- *d)* Rubbing

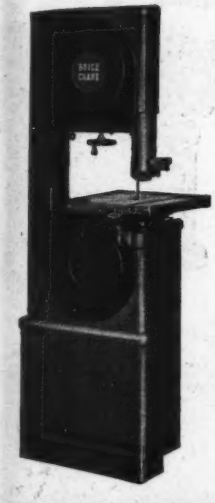
Overlay Carvings
Panel or Plywood — 3-ply, 5-ply, and 7-ply
Pattern Letters
Pins — escutcheon
Pumice Stone — No. 0
Rapping Plates
Rottenstone
Sandpaper — Garnet cabinet paper, 3/0, 2/0, 0, ½, 1 (running from fine to coarse)
Garnet finishing paper, 6/0, 4/0
Garnet paper can also be obtained in rolls of 50 yd. in widths 4 in. up to 48 in. Narrower widths on special order
Screw Eyes
Screws
- *a)* Flat-head, brass, No. 3 x ⅜ in., No. 4 x ½ in., No. 5 x ⅝ in., No. 5 x ¾ in., No. 6 x ¾ in., No. 8 x 1 in., No. 10 x 1¼ in., No. 10 x 1½ in., No. 12 x 1¼ in., No. 12 x 1¾ in., No. 10 x 2 in.
- *b)* Flat-head, bright, No. 3 x ½ in., No. 4 x ½ in., No. 6 x ¾ in., No. 8 x 1 in., No. 10 x 1 in., No. 10 x 1¼ in., No. 8 x 1¼ in., No. 14 x 1¼ in., No. 10 x 1½ in., No. 12 x 1½ in., No. 10 x 1¾ in., No. 12 x 1¾ in., No. 10 x 2 in., No. 12 x 2 in., No. 14 x 2 in., No. 12 x 2¼ in., No. 14 x 2¼ in., No. 14 x 2½ in.
- *c)* Oval-head, brass, No. 5 x ¾ in., and No. 10 x 1¼ in.
- *d)* Round-head, blued, No. 3 x ⅜ in., No. 3 x ½ in., No. 5 x ¾ in., No. 6 x ¾ in., No. 8 x 1 in., No. 10 x 1¼ in., No. 10 x 1½ in., No. 12 x 1½ in.
- *e)* Round-head, brass, No. 2 x ⅜ in., No. 3 x ⅜ in., No. 4 x ½ in., No. 3 x ⅝ in., No. 5 x ¾ in.

Shellac
- *a)* Orange, cut 4 lb. to the gal.
- *b)* Sticks, assorted colors
- *c)* White, cut 4 lb. to the gal.

Note: Shellac should be kept in glass or earthenware containers
Stains — oil, spirit or water: Fumed oak, dark oak, golden oak, light oak, mahogany, and walnut
Steel Wool — No. 0 and No. 00
Turpentine
Twine
Varnish — coach, flat, remover, spar, and rubbing
Waste — cotton, white
Wax — bees and finishing
White Lead

Training For Defense OR for a "First Line Of Defense" against

• SHOP ACCIDENTS
• HIGH EQUIPMENT COST
• IMPRACTICAL EQUIPMENT



SPECIFY BOICE-CRANE POWER TOOLS

The very emergency character of defense training places an extra obligation on educators to use double care in selecting equipment.

To make your courses unusually practical; to turn out really skilled mechanics quicker than ever before; to practically eliminate the accident hazard of "learners"; and to make your allottment of equipment funds provide training tools for the greatest number — follow in industry's steps — install practical, inexpensive Boice-Crane Power Tools.

Machines for Many Purposes — Prompt Delivery

Boice-Crane machines for both woodworking and metalworking are made in a big range of types, sizes and models. You are sure to find just what you want in our extensive line. Every machine is designed and built strapping strong, using only the best hard-to-wear-out materials made to extreme precision.

You save on space and power when you install these safer, husky, precision-built Boice-Cranes . . . real advantages when existing facilities are taxed to the very limit. Prompt delivery can still be guaranteed you on these better value Boice-Cranes. Better investigate them now!

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(Continued from page 14A)

The school cannot justify the flooding of any occupation with mediocre workers. Its product must be of a high standard and its volume of output as great as the absorbing power of the market. Unseen forces will defeat the school's efforts unless scientific methods are used to determine these factors. Close cooperation between the school and labor will tend to improve the functioning of such a program.

Many simple errors may eventually *short circuit* a diversified occupation program unless special effort is made to avoid them. Great criticism will result if errors are allowed to accumulate. To uphold the standards of industrial education, the program must be built upon a sound foundation, eliminating all inferior material which may eventually weaken its structure and cause its collapse.

Students are constantly asking for more vocational training. The need for this training is apparent when the occupational condition of the country is reviewed. Like the sailor in the crow's-nest, industrial educators must keep their eyes constantly on the horizon to avoid missing any important trend which may improve the present position. Youth must be given greater opportunity and this will evolve only if the problem is carefully and objectively studied.

Qualifications of An Industrial-Arts Teacher

EUGENE GIAMMATTEO*

Do you wish the world were better?
Let me tell you what to do:
Set a watch upon your actions,
Keep them always straight and true.
Rid your mind of selfish motives,
Let your thoughts be clean and high.
You can make a little Eden
Of the sphere you occupy.

Do you wish the world were wiser?
Well, suppose you make a start
By accumulating wisdom
In the scrapbook of your heart.
Do you waste one page on folly,
Live to learn and learn to live?
If you want to give more knowledge,
You must get e'er you can give.

Do you wish the world were happy?
Then remember day by day
Just to scatter seeds of kindness
As you pass along the way.
For the pleasures of the many
May be oft times traced to one,
As the hand that plants an acorn
Shelters armies from the sun!

Nearly two thousand years ago Christ selected twelve men as co-workers. His choice was not made from the leading schools of His time, but rather from the common folk whose daily bread was earned by the sweat of their brows. His choice was made not on the intellectual qualifications or attainments but upon the sincerity of their hearts, the nobility of their characters and the sterling qualities of their magnanimous souls. That His choice was well founded is a matter of history and common knowledge.

Plato suggests in his "Republic" that he would prepare the leaders of his Utopia, men who were willing to go through rigid training with quinquennial competitive rigorous examinations. As a natural process of elimination through examination, those few that survived the ordeal were fairly well qualified on reaching the age of 35, to begin their research for a "brief" period of 15 years in the market place. There they rubbed shoulders with people — in the real university of life. At the age

(Continued on page 26A)

*Supervisor of Manual Training, Bristol, Conn.

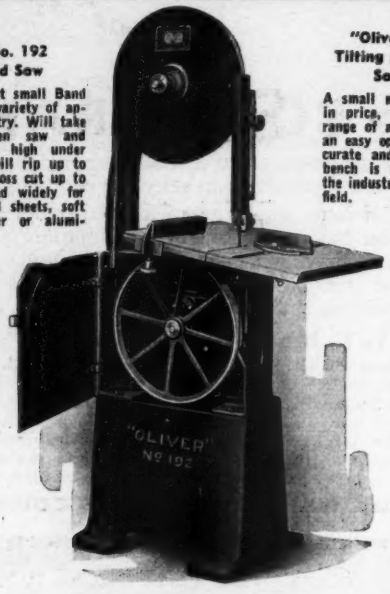
OLIVER MACHINERY EXCELS IN PRODU

"Oliver" No. 217
30 in. Band Saw

Automatic brake for upper wheel, complete guarding of all moving parts, enclosed, oil immersed, self locking tilting device for the table, foot brake that shuts off the current and stops the machine quickly — these and many other modern refinements make this one of the most practical and efficient production tools available anywhere.

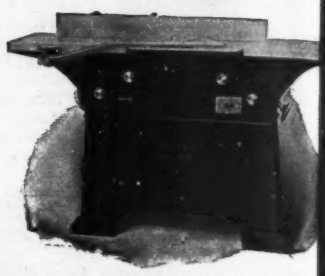
"Oliver" No. 192
18 in. Band Saw

A portable, efficient small Band saw, with a wide variety of applications in industry. Will take 18 inches between saw and column, 9 inches high under upper guide and will rip up to 11 in. wide and cross cut up to 6½ in. wide. Used widely for cutting light metal sheets, soft iron, brass, copper or aluminum.



"Oliver" No. 232
Tilting Arbor Variety Saw Bench

A small machine, moderate in price, but with a wide range of adaptability where an easy operating, safe, accurate and dependable saw bench is needed either in the industrial or educational field.

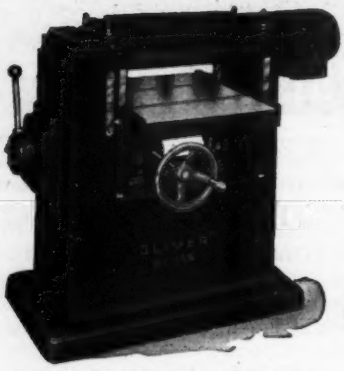


"Oliver" No. 189 Hand Planer and Jointer

A self-contained, practical, easy operat Jointer, with all the advantages of larger machines. One of the safest most efficient Jointers in the market.

"Oliver"
No. 299
Single Surfacer

Single massive, box-type casting insures permanent alignment. Easy accessibility to all parts, electric controls within easy reach of operator, circular safety type Cutterhead and practically every modern improvement known, make this "Oliver" Surfacer equally adaptable to the school or factory.



"Oliver" No. 399 Single Surface Planer

Within its capacity, and where a planer that will take 18" wide by 6" high is sufficient, this machine has been characterized as the most perfect Small Surfacer obtainable anywhere.

"Oliver" No. 585
Variety Oilstone Tool Grinder

Can be placed where most convenient, since only a plug and cord are needed. Insures better work, since it encourages proper care of tools.

"Oliver"
No. 194 Por
able Hollo
Chisel
Mortiser

Capable of a w
range of wor
operating
and adjustm
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of the opera
Bit travels to
work and the
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and can be ta
to the job to s
time. ½ H
vertical ball be
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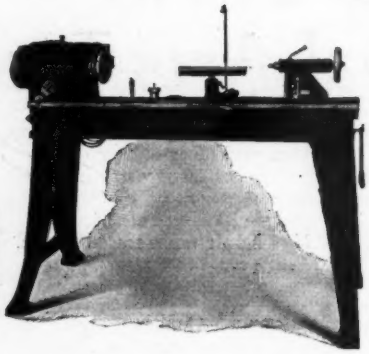
"Oliver" No. 51
Speed Lathe

Four speeds instantly and conveniently available. Unique, new type of sliding control, mechanical brake with automatic cut-out, complete every desirable convenience.

"Oliver" No. 159
"V" Belt Motor Driven Speed Lathe

Any speed from 800 to 2400 r.p.m. instantly available by the simple setting of the speed control. Safe, simple, efficient, equally useful for the school or industrial shop.



OLIVER MACHINES ARE USED IN THOUSANDS OF ND

ION AND IN TRAINING FOR PRODUCTION

Favored Equipment in Industry And for School Shop Training

Approval and purchase of "Oliver" machinery by more than 2000 school shops is an outstanding recognition of "Oliver" high standards of safety, utility, durability — in short, their ability to operate satisfactorily for many years.

Important features responsible for Oliver leadership are prominent factors in the progress and development of woodworking departments in the school shops — a development with which "Oliver" has been closely identified from the very beginning of industrial arts and vocational education.

The illustrations on the opposite page are typical of the complete line of "Oliver" woodworking machinery. The machine tools illustrated are most important in the national defense training program. The "Oliver" line includes Sawing, Planing, Jointing, Turning, Sanding, Boring, Mortising, Tenoning, Shaping Machines; also Spinning Lathes, Wood Trimmers, Oilstone Tool Grinders, Vises, Glue Pots, Band Saw Blades, Circular Saws.

The extensive use and satisfactory service of "Oliver" woodworking machinery in industry qualifies this equipment for use in vocational training for national defense.

Special cooperation is offered to school executives in organizing, planning, and equipping woodworking shops. Inquiries and correspondence relative to requirements are solicited.

OLIVER MACHINERY COMPANY
GRAND RAPIDS, MICHIGAN

OF INDUSTRIAL AND SCHOOL SHOPS EVERYWHERE

IN EVERY SCHOOL SHOP

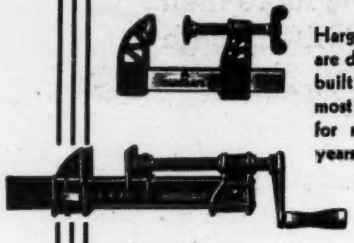
The Hargrave line of Clamps, Chisels and Punches are INDIVIDUALLY TESTED to insure the efficient and lasting service which they will give not only to industry but in school shops as well.

Made of the finest quality materials under expert workmanship, they will give satisfaction and above all, Hargrave Clamps, Chisels and Punches are economical.

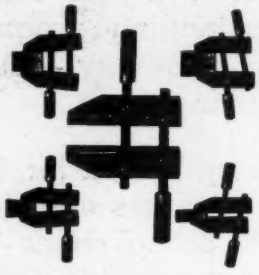
No. 263 No. 223 No. 200

No. 2866 No. 284

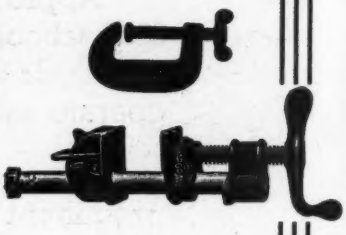
Hargrave Chisels and Punches cut faster, last longer. Trip hammer forged, individually tested. Large selection of styles and sizes available.



Hargrave Clamps are designed and built to give utmost satisfaction for many, many years.



All sizes and styles for every type and kind of work available.



Write for catalog illustrating the complete line and prices.

THE CINCINNATI TOOL COMPANY

Waverly and Main Aves. **ESTABLISHED 1879** **Cincinnati, Ohio**

QUALIFICATIONS OF AN INDUSTRIAL-ARTS TEACHER

(Continued from page 23A)

of 50, they were fairly well qualified to assume the duty of public office.

A teacher, in every sense of the word, should work for the sheer love of teaching. The heartaches overbalance the remunerations, hence the choice should be the privilege to do what they actually love to do irrespective of recompense. A teacher is a very vital human force in molding and shaping the lives and learning of his pupils. His preparation should be very extensive; in fact, it never ceases while he is alive to the obligation which he owes society. His cultural background should be broad, and it should be kept expanding constantly. In addition to his qualification of subject matter, he should also possess that divine gift, the sympathetic understanding of youth. His soul must, of necessity, be big of understanding that he will reverence and stand in awe before childhood. He is the engineer of their future destinies — there must be no guesswork — he must be prepared to influence a personality and inspire confidence to achieve, through youth, a better and finer human relationship, resulting in a happier and more abundant life. Though his life need not be flawless, both his integrity and prestige should goad him on to be a pattern of a real human being rather than a mere walking encyclopedia.

With the urge and desire for self-improvement, his preparation goes on indefinitely. With his simple philosophy that the child is the thing at issue, all the agents of his laboratories of experience and wisdom are at work for that aim and scope. He must be able to come down to the level of the child so that he may experience the elixir of youth with its uncontaminated happiness and thereby remain mentally alert and vigorous. Endowed with natural curiosity, his emotional reactions must respond to the grandeur of man's achievements through the ages. His appreciation is augmented, his mind is kept alive and keen and his being is overrun with the deluge of inspiration to further his daily efforts at guiding and enlightening those hungry sheep that it is his privilege to feed. Though his body ages with the unavoidable march of time, his spirit and energy are kept young with the daily contact of those human dynamos — the children. A teacher should possess an inner spark, the curiosity of youth, the wonder of maturity, and the *feel* of things. His interests should be many and varied. He must be well read and well informed. His speech should be such as to display intelligent intellect. He should possess an ethical sense of proportion and a common understanding of human behavior which will stamp him as a man of fine moral character. He must never cease to be a human being among humans and he must not lose the common touch. He should be a real guiding influence of future lives. He must be at home, poised and self-possessed among the intelligentsia, at ease in the midst of the cultured, and an example of humbleness amongst those unfortunates who are mentally deficient.

One may reasonably ask — where will you find such a being? The answer is simple. You may school a pedagogue — but a *real* teacher is born!

Our changing world clearly shows that everything changes except change. The teacher that cannot accept change is as distinctly dead as the extinct "dodo." The real teacher has vision and outlook for the sake of the progress of human endeavor. He gives a lot, though he may receive but little. In reality the satisfaction of having done a sincere and constructive piece of work is not purchasable with mere material or financial gain. Such men need not be in the majority — few as they may be they act as a guiding force to the profession, endear themselves to the hearts of men — influence the times in which they live; make history and live forever. In the race of the common struggle for an existence, they constitute the intellectual giants who set the pattern for finer and nobler human relations, built on trust, confidence, and love.

It's doing the job the best you can
And being just to your fellow man.
It's making money but holding friends,
And staying true to your aims and ends.

(Continued on page 32A)

IMPORTANT

to

ALL SCHOOLS

Contemplating participation or already in on the

NATIONAL DEFENSE PROGRAM

BRODHEAD-GARRETT CO. is anxious, qualified and thoroughly equipped to assist you in the proper procurement of all necessary machinery, material and supplies — yes, even to the planning and laying out of your shop for you. For more than three decades we have built up an enviable record as a most helpful and dependable supply source of Industrial Art needs for schools in every state of the Union. Among the scores of manufacturers for whom we serve as National School Distributors are the following:

Atlas Press Co.	Millers Falls Co.
Champion Blower & Forge Co.	Osborn Mfg. Co.
Chase Brass Co.	Peck, Stow & Wilcox Co.
Cincinnati Tool Co.	The Standard Tool Co.
Cleveland Twist Drill Co.	Stanley Tool Works
Columbian Vise & Mfg. Co.	The L. S. Starrett Co.
Henry Disston & Sons	The Walker-Turner Co.
The Lufkin Rule Co.	The Yates-American Mach. Co.

Also Complete Assortment of Kiln-Dried Lumber

WIRE OR WRITE

us at once regarding your needs and your problems. You will receive our immediate attention—if necessary, we shall gladly send one of our representatives to confer with you in order that you may avail yourself to the fullest of your share in the National Defense Program.

BRODHEAD-GARRETT CO.

"Supplying Industrial Arts Needs to Schools in All 48 States

4560 East 71st Street Cleveland, Ohio

CATCHING ON TO METALCRAFT!

There's more than just a knack to making progress in metalcraft. The success of your students in this work depends on the equipment and materials given them, as well as the skill you help them develop.

You can give your boys one of the basic keys to metalcraft by supplying them with Kester Flux-Filled Solder. You'll find many of them will quickly develop an expert soldering technique with this modern, high quality solder. And good soldering will improve their work all along the line.

Virgin metals only are used in making Kester Solders and the scientifically prepared flux is self-contained in the core of the solder, itself. These are the big factors in perfecting solder-results.

Kester Flux-Filler Solder is one of the basic materials used throughout industry. When you teach its applications and advantages to your classes you are adding an important piece of knowledge to their practical education.

Order a trial supply of Kester Flux-Filled Solder for each of your students — from your wholesaler, or direct from the address below.

KESTER SOLDER COMPANY

4257 Wrightwood Avenue, Chicago, Illinois

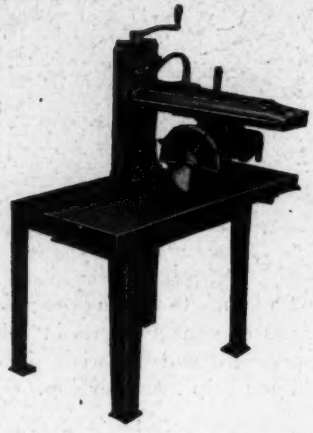
Eastern Plant: Newark, N. J.
Canadian Plant: Brantford, Ont.

KESTER
FLUX-FILLED SOLDER

SHOP EQUIPMENT NEWS
New Products—Publications

WALLACE NO. 1 RADIAL SAW FOR WOODCUTTING

An improved radial saw with a newly designed stand and table has just been announced by J. D. Wallace & Company. The new table facilitates the efficient use of the radial saw for handling cross-cutting, angle cutting, mitering, bevel angle cuts, ripping, bevel ripping, shaping, rabbetting, tenoning, dadoing, grooving, and many other milling operations.



It is designed to permit cutoff and angle work on both the "push" and "pull" strokes of the motor alternately. Stainless-steel degree scales indicate the depth of cut or dado, width of rip, or angle of bevel rip.

The Wallace No. 1 radial saw is very efficient in handling long and heavy stock, since the material is laid flat on the table while the motor unit is pushed or pulled across it in making the cut. New geared motors of one or two h.p. have a spindle speed of 4900 r.p.m. — adequate for fine shaping and routing work — and with blade capacities up to 11 in. in diameter, cutting up to 4-in. material.

Roller extensions are available for the tables for bolting to each side of the machine to support long pieces. The radial saw is widely used by contractors and builders, lumberyards, mills, cabinet shops, for cutting crating stock, general plant maintenance, furniture factories, all kinds of production operations and in schools teaching practical vocational training in cabinetmaking and the building trades.

For complete information write to J. D. Wallace & Company, 140 S. California Ave., Chicago, Ill.

ENGINEERS FLUORESCENT NORTHERN LITE

This new light assures the user top lighting qualities that approximate daylight from a north exposure.

The secret to this eye-saving light is its special pigment-treated reflector which balances the irritating, heavy, blue light common to ordinary fluorescent lighting and produces a neutral colorless light, making eyework easier and quicker.

Actual tests show that the Engineers Fluorescent light produces two and a half times the light intensity of an incandescent light using an equal amount of power.

This light permits working close to the light source without irritating heat. It produces only one fifth as much heat as an incandescent light that gives an equal amount of illumination.

It is attractively finished in brown Matelasse with silver trim on the shade.

Quick, positive adjustments set the swivel arm at any position from the table top to 24 in. Shade is adjustable in a horizontal arc 360 deg. and in a vertical arc 180 deg.

This light is available in two models — No. 2224A is fastened to the drawing surface by a clamp. No. 2224B has a screw anchor attachment for permanent installation.

Write for further information and illustrated description to your nearest Post Oval Dealer or direct to The Frederick Post Co., P. O., Box 803, Chicago, Ill.

HIGGINS NEW PEN FILLER

The desk bottle of Higgins American drawing ink now comes equipped with a new type pen filler guaranteed to take up more ink. This improved filler which has been nicknamed "The Little Big Dipper," is made of clear Polystyrene, a product of the Bakelite Corporation. The choice of this plastic was arrived at after lengthy tests to insure that it would not soften or decompose in the ink.

This new plastic pen filler is superior to the natural feather quill hitherto used because of its uniform length, diameter and thickness of material. The scoop of the filler, insures speedier and more accurate service to its users, and the offset shape helps in getting the last few drops of ink from the bottle.

The company also is retaining the patented features of their famous steeple topped stopper along with the improved quill. Among the most important of these are six shoulder ridges which invite easy twisting for extraction and the fact that the stopper is so balanced that it will always rest with the tip of the quill upright preventing stains on drawings and drawing boards, also the nonrolling feature and the flat thumb rest, which insures that the scoop of the stopper will be in correct position for filling the ruling pen when it is extracted from the bottle.

NEW FINISH FOR HOLD-HEET PYROMETER

Hold-Heet Pyrometer, manufactured by Russell Electric Co., 343 West Huron Street, Chicago, is now being put out with a new black crackle finish, which is impervious to oil and avoids the tarnishing characteristics of bright metal.

The Hold-Heet Lance Pyrometer was developed to meet the need for a low-cost dependable heat-checking instrument. It indicates temperatures instantly within 2 per cent of absolute accuracy. Its easily replaceable tips make it good for years of service. It reads directly and has manual cold end adjustment. No battery nor electrical connections are necessary. The thermocouples are of six-gauge wire (slightly larger than 3/16 in.) which is heavy enough to stand up under rough shop usage.

The Hold-Heet Lance Pyrometer is useful for checking the temperatures of tin, lead, solder, babbit, type metal, spelter, and brass, also for checking high surface temperatures of billets, slabs, heated rollers, forgings, and the like, as well as for ovens, hotplates, heating elements, etc.

Another valuable application of the Hold-Heet Pyrometer is in detecting heat leaks in boiler heatings due to broken baffles, loose bricks, soot, scale, warped doors, and the like.

A new illustrated bulletin will be sent free of charge to any firm writing to Russell Electric Co., 343 West Huron St., Chicago.

NEW DOUBLE-EDGED HACK SAW

A new development of Millers Falls Company, Greenfield, Mass., this two-edged hack-saw blade costs only 50 per cent more than a single-edged blade and yet is capable of doing twice as much work. Teeth along the first cutting edge are set fractionally wider than along second, eliminating drag and wear formerly an obstacle to the use

of this idea. Guaranteed shatterproof and unbreakable, this blade has a special heat treatment which leaves teeth hard, ends and center soft. Millers Falls reports exhaustive tests revealing that each side delivers full performance even on positive feed machines, cutting twice the usual maximum depth at each stroke; production time may thus be reduced by half on hack-sawing operations.

The cash and timesaving possible with this double-life blade, together with the safety and delay-proof production made possible by its unbreakability, means much to America at this time when the metalworking industries are being pushed to capacity.

NEW DITTO GELATIN DUPLICATOR

The newest Ditto rotary gelatin duplicator brought out by Ditto, Inc., of Chicago delivers 100 bright copies from each original for less than five cents per hundred copies. It reproduces eight

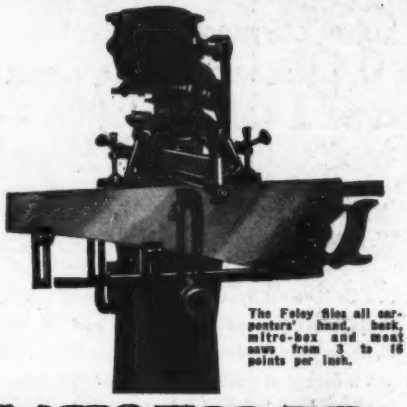
colors in one operation and any combination of pencil, pen and ink, or typewritten work. Sixty to 75 copies can be made per minute.

Any size sheet can be reproduced, from a post card to 9 by 14-in. copies are delivered face up and absolutely flat.

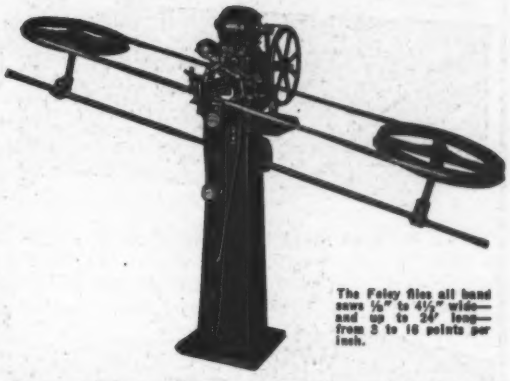
(Continued on page 31A)

MODERN SAW FILING EQUIPMENT

The Foley files cross-cut circular saws from 3" to 16" in diameter, (up to 24" optional). Keeps saws in perfect circle.



The Foley files all carpenters' hand, back, mitre-box and meat saws from 3 to 16 points per inch.



The Foley files all band saws ⅛" to 4½" wide—and up to 24' long—from 3 to 16 points per inch.

FOLEY AUTOMATIC SAW FILER

One Machine Files Hand, Band and Circular Saws.

A FEW TYPICAL SCHOOL USERS

Beloit Vocational School, Beloit, Wis.
Battle Creek (Mich.) Public Schools
Board of Education, Baltimore, Md.
Board of Education, Rochester, N. Y.
Board of Education, Tulsa, Okla.
Chicago (Ill.) Public Schools
Iowa State Teachers College
Kansas Agriculture College
Pittsfield (Mass.) High School
School Board, Washington, D. C.
Frank Wiggins Trade School, Los Angeles
Syracuse, N. Y., Public Schools

30 DAY TRIAL

We want you to see for yourself in your own shop what a wonderful labor saving and efficient machine the Foley Automatic Saw Filer really is. Send for our booklet giving full details on new Model F-16 with many advanced features.

The new Model F-16 Foley Automatic Saw Filer is unequalled for accuracy, ease of adjustment and long life. Its perfected design is the result of 40 years' experience. Patented jointing principle automatically evens up large and small teeth, so saws cut faster, truer, cleaner — stay sharp longer. Foley filed saws have less breakage and last longer. Train your students to use modern equipment and keep your saws sharp at lowest cost.

FOLEY MFG. CO. 18 Main Street N.E., Minneapolis, Minnesota

Please send me booklet and full information on use of the Foley Saw Filer in manual training departments, without obligation on my part.

Name.....

Address.....

School.....

(Continued from page 28A)

The new machine combines the advantages of sturdy build, fast operation, and modern appearance.

Quick changes of films permit rapid reproduction of different jobs, which is an advantage where the machine is used for heavy production.

ONE-HUNDREDTH ANNIVERSARY FOR DISSTON

Henry Disston & Sons, Inc., of Philadelphia, pioneer saw manufacturer in the United States, this year is observing the one-hundredth anniversary of the founding of the company — "One Hundred Disston Years" in which the management of the business has remained in the hands of the same family.

The bustling 65-acre plant is going about its business of producing upwards of 5,000,000 saws and blades a year, while geared to top production on government orders in the National Defense Program, but company officials have planned tribute to the memory of Founder Henry Disston.

S. Horace Disston, president of the firm, dedicated a memorial gate at the Disston Athletic Field before an assemblage of 1000 workmen and friends of the company on May 24, the date of the founding. Sealed into one of the gate pillars was a stainless steel box containing six hand saws in models from that of 1874 to the latest design; a dozen hack-saw blades and a dozen files; a circular saw and a pruning saw; a groover and inside cutters and assorted Disston literature.

The gate dedication also was made the event for the awarding of a service pin, set with diamonds, to Disston's "grand old man," George Metzger, 83-year-old foreman of the blacksmith shop, honoring him for 70 years of active employment.

Disston management has always held that a man is entitled to employment so long as his ability and skill is unimpaired. Proof of the soundness of this view may be seen in the fact that six Disston employees have worked for the company for 60 years and 49 for 50 years. In all, 25 per cent of the Disston employees have worked for the company for 20 years or more. There are seven three-generation family groups at work in the plant, consisting of grandfather, father, and grandson. In addition, Disston maintains a pension plan for employees who wish to retire or those who are no longer able to continue.

FIFTY YEARS OF MANUFACTURED ABRASIVES

The Carborundum Co., Niagara Falls, N. Y., celebrates the Fiftieth Anniversary of the invention of silicon carbide — the first abrasive substance to be made by man on a commercial scale. Because of the great importance of this invention to all industries, and thus to society as a whole, it may be of interest to hark back to 1891 when Dr. Edward G. Acheson performed his epochal experiment with a plumber's solder-melting pot, to which he had connected a copper wire, a piece of arc-light carbon also connected to a copper wire, and a mixture of clay and coke.

With this crude apparatus and a heavy electric current, he succeeded in producing a few particles of an exceedingly hard substance which he called carborundum and thus started off the era of precision grinding which has done so much to make possible the thousands of wonderfully efficient mechanical and electrical contrivances of our times.

FACTS FOR SCHOOL PRINT SHOPS

The American Type Founders, Department of Education, Elizabeth, N. J., have just issued "Facts About the Printing Industry for Schools."

The material for the 18-page, 8½ by 11-in. booklet was compiled by John A. Backus and Milford M. Hamlin.

The authors have given an exceedingly fine, thorough, brief history of the art of printing, the growth of printing as an industry, its need for skilled workers, its stability as an industry, its employment and wage opportunities, and the dependence of this age on the services of this art.

The material is admirably interspersed with elucidating diagrams showing comparisons between the number of establishments, wage earners, employment trends, weekly earnings, and the like, in the printing, and other industries.

The content of this booklet is ideally suited as related subjects material or as data for vocational-guidance information in the school print shop.

NEW SOUTH BEND LATHE CATALOG

The South Bend Lathe Works, South Bend, Ind., has just issued a new most complete lathe catalog, containing 112 pages and over 240 illustrations. Fifty different sizes and types of South Bend back-geared, screw-cutting lathes for manufacturing, toolroom, and general shopwork are listed. A copy will be mailed on request to any firm or individual mentioning this magazine.

Sizes of lathes illustrated are 9, 10, 13, 14½, and 16 in. and 16 to 24 in. swing. Each size is shown in several different models. New items shown include the Model "A" 9-in. workshop toolroom lathe; the 10-in. swing 11/16-in. collet series "S" lathes; and the 10-in. Swing 1-in. collet lathes.

NEW ATLAS CATALOG

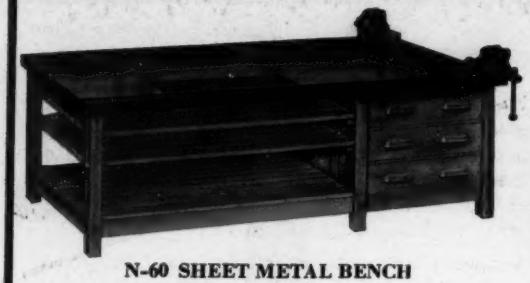
A thirtieth-anniversary catalog of Atlas machine tools and shop equipment has just been released. This attractive new 72-page book includes complete information on 1941 models of Atlas lathes, drill presses, arbor presses, and shapers, and announces two new machines — a compact bench miller and a multiple spindle drilling machine. Copies of the catalog are available from Atlas distributors or Dept. 7, Atlas Press Company, Kalamazoo, Mich.

GARDINAR METAL COMPANY CATALOG

In the catalog put out by the Gardinar Metal Company, Chicago, Ill., will be found information concerning the Gardinar Rosin-Core Solder.

(Continued on page 32A)

TAKE A LETTER AT ONCE, MISS JONES!



N-60 SHEET METAL BENCH

Gentlemen:
Please mail us your catalog on Benches and Drafting Tables --- We are enlarging our Vocational Department to provide capable men for local Defense Industries.

P-51 DRAFTING TABLE

... Or better still, ask us to have one of our Sales Engineers call on you. During the past 18 months Sheldon men have equipped many Army, Navy and Industrial projects and as a result can bring you first hand knowledge of defense-vocational requirements.

You assume no obligation for Sheldon planning which can provide you a valid and valuable service pertaining to layout, budget estimates, and specifications. Write today requesting catalog or personal sales contact.

N-14 MANUAL TRAINING BENCH

E. H. SHELDON & CO.
MUSKEGON 720 NIMS ST. MICHIGAN

QUALIFICATIONS OF AN INDUSTRIAL-ARTS TEACHER

(Continued from page 26A)

It's figuring how and learning why,
And looking forward and thinking high,
And dreaming a little and doing much;
It's keeping always in closest touch
With what is finest in work and deed,
But being thorough yet making speed,
It's being clean and it's playing fair;
It's laughing lightly at Dame Despair;
It's looking up at the stars above
And drinking deeply of life and love.
It's struggling on with the will to win,
But taking loss with a cheerful grin;
It's serving, striving, through strain and stress,
It's doing your noblest — That's Success!

(Continued from page 31A)

This speedy and economical solder is available in all commercial alloys of tin and lead, and only virgin metals of great purity are used. This solder assures faster and cleaner work and a bond of greater tensile strength. Where the job must be secure, yet free from all corrosion, this solder sets a high standard of performance.

A copy of the catalog is obtainable on request.

Pertinent Paradoxes

DEAN M. SCHWEICKHARD*

Life's Absurdities

Youth are usually more frank in the open discussion of their problems among themselves than they are in the presence of older people. The reason seems to lie in a lurking, though often unidentified fear of criticism or ridicule. Too frequently the result is that, if the problem can be put before no one but an adult, it is held in the heart of youth and grows in magnitude until it produces the result he sought to avoid. The development of peculiar character traits by this means brings forth the very adult reaction which was originally feared.

A group of young people recently were discussing the feeling of fear or uncertainty one has in attempting to speak before an audience. As nearly as it could be put into tangible form their conclusion was that they had a certain inexplainable fear of making a mistake or forgetting, and thus being put in an absurd or ridiculous light.

Similarly free confession was made of the intense desire to copy from a fellow student's test paper in order to supplement one's own deficiencies and make the results appear to be as good as possible. Reasons given for wanting to stand well in examinations were to help get good marks and to maintain a favorable position in the eyes of the teacher. Carried further, the line of thinking seemed to be that a collection of good marks from high school helps when seeking entrance to college or in getting a job.

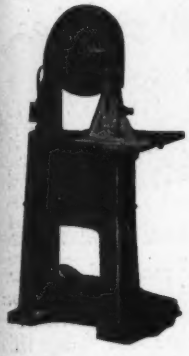
Situations such as these serve as reminders of the human eagerness to avoid the embarrassment which comes from being unfavorably conspicuous. This very eagerness, however, may be the underlying cause for the development of various paradoxical personalities and relationships. The student who seeks to pass the examination on the strength of knowledge other than his own forgets that he is building into his life an absurdity of greater magnitude than the immediate one he feared.

Some of the absurdities of human experience are suggested in certain catch phrases readily recognized. What is likely to be involved when one speaks of a *friendly enemy?* To speak of one as a *perfectly healthy invalid* suggests some sort of maladjustment or unnecessary hangover from a once existent malady. A small

(Continued on page 34A)

*Assistant Superintendent of Schools, Minneapolis, Minn.

Training for National Defense?



Wallace 16" and 14" Bandsaws — speedy, accurate, durable. Motors up to 2 H. P.

NO matter what your woodworking machinery requirements, you'll find the answer in J. D. Wallace & Company's complete line of woodworking machines partially illustrated on this page.

You'll find Wallace machines in small cabinet shops, furniture factories, mills. And you'll find them engaged on small residential construction jobs, and in the small industrial plant.

But they don't stop there — for these quality-built machines have the speed, stamina and power required today in the building of army barracks, the construction of munition plants, the production of modern airplanes and flying equipment. Wallace machines cut costs on toy airplanes, — and on the super-dreadnaughts that guard our shores!

You'll find them in the maintenance shops aboard Uncle Sam's battle-ships, — and in the National Youth Administration shops operated under government supervision.

For fine furniture and cabinet-making, for precision patternmaking, for teaching modern building trades and industrial work-methods, you can buy no better machines at *any* price. *Safety* is guaranteed with modern approved guards.

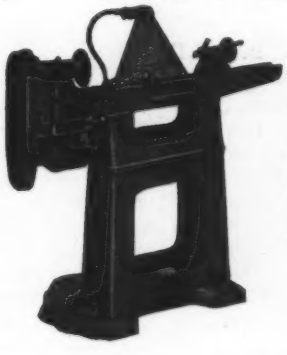
Accuracy is maintained by machining to close tolerances, and by provisions for adjustment on most parts subject to wear. *Durable*, of course, being made of the best materials.

What about *Economy?* Well, the true answer can only be determined by Experience, — by an addition of first cost *plus* maintenance cost *less* the value in trade when changes are made. Twenty-five years of Experience shows that Wallace tools are the most *economical*, all things considered, of any equipment manufactured.

We'll be glad to confer with you at any time. Tell us of your requirements — we'll see that complete bulletins and quotations are forwarded promptly and without obligation.

Wallace Mortiser —handles chisels and bits up to 1" square. Direct-drive motors up to 2 H.P.

Wallace Universal Saws — up to 4" depth of cut, 14" cut-off, 48" rip. One and 2 H.P. motors. Tilting arbor.



Wallace Lathes —with automatic tensioning drive. Perfect for woodturning and metal-spinning.

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Wallace Shapers — 8,500 or 10,000 r.p.m. Direct-drive motors, safe, powerful, smooth-cutting.

Wallace Oilstone Grinder —geared slow to prevent toolburning. No flying emery or exploding wheels. Safe.

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Woodworking
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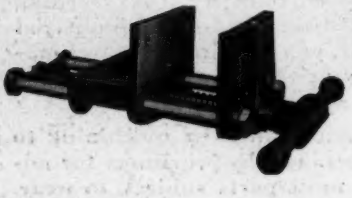

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MORGAN offers you one of the most complete assortment of sizes and types of woodworking vises in the country. Continuous screw vises are furnished with either wood handles or all steel adjustable handles. Strong — dependable—accurate—designed to meet any need.

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Thousands of schools throughout the country are real boosters for MORGAN VISES. A continual and satisfactory service has made this possible. The best of materials and workmanship go with the manufacture of these vises, and when you want a real vise that can "take it", specify MORGAN.

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Metalworking
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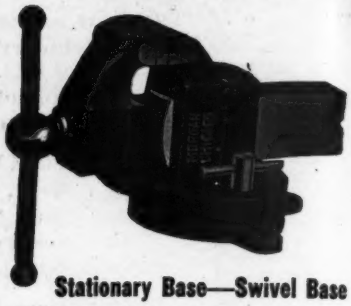

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MORGAN VISE CO.

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PERTINENT PARADOXES

(Continued from page 32A)

town boasts of being the *biggest little* town on the map. Certain traits of attitude or behavior bring an individual now and then to be spoken of as *an old boy* or *an old girl*. To brand someone as a *poor rich man* leads us to wonder what is likely to be wrong with him; while to reverse the phrase into that of a *rich poor man* prompts us to inquire at once as to what could make a man rich when he is poor.

Reversal of Motives

In the human heart there is a motive which would result in sharing one's last morsel of food with a hungry fellow being or even a dog in the wilderness or on a desert island. A strange turn of affairs thwarts or stifles this motive when millons starve in a world of plenty or the lone beggar appears at the door. The explanation is that it is not expedient, but we shall need more than an academic explanation before this fundamental motive is unshackled to serve the purposes for which it was created.

In the days when the horse and buggy were realities and not just words to describe an outmoded era, it was common practice for a driver with an empty seat to take in the plodding traveler and help him on his way. The motive which prompted such an act was undoubtedly a desire to be of help to one less fortunate. Today, we have gone far from that day in means of transportation, but something has happened likewise to the former practice of helpfulness. Perhaps one of the elements in the change has been the tendency of the one being helped to abuse the privilege extended to him.

Time is not the only factor which operates to reverse the order or the effect of simple human motives. Without regard to time we may too frequently observe paradoxical behavior within ourselves or others which is difficult to explain, much less to justify. A common example is to talk one way to a person's face and another way behind his back. We are inclined to condemn others for the same things which we condone in ourselves; and to preach virtues but fail to practice them. The individual who shouts most loudly against an evil may even be found to be involved in its practice or promotion.

Situations which should be sources of happiness often bring forth tears, as in the case of weddings, reunions, and victory or success of friends. We get angry at the other fellow when the fault is our own; we say yes when we mean no; we do what we would not, and leave undone the things we would do; we stay up at night and sleep in the day; and elect people to office or let them be elected, and then complain about them. Most baffling of all is to realize that man has thus far discovered no universally effective way to secure peace except to fight for it.

A Matter of Education

The inclination to turn the scorching blast of criticism or inquiry on the other fellow often brings a deluge of attack upon the schools, which they are not always adequately prepared to meet. The attack may come from a disgruntled individual or group in the community, from some other branch of public service, or from any one of a number of sources. In substance they say, "Why should we spend so much money for schools and get such poor results?"

Rather than to deny outright that such a paradox exists it may be well to inquire into the extent to which it may be true. The first question we might ask is: "Even though large amounts of money are spent and results are not satisfactory, does the trouble lie entirely with the schools?" A manufacturer who had made a large investment in a factory, and then began to get complaints on his product, would go all the way through the line to discover the seat of the difficulty. He might find it in the raw material, in one of the processes of manufacture, in poor workmanship, or in some of the conditions to which the product was exposed before or after its completion. If the correction of the difficulty requires the expenditure of more money the additional funds are considered wisely spent.

Schools today do cost money, but they

(Continued on page 38A)

ABILITY to OPERATE ELECTRIC SANDERS

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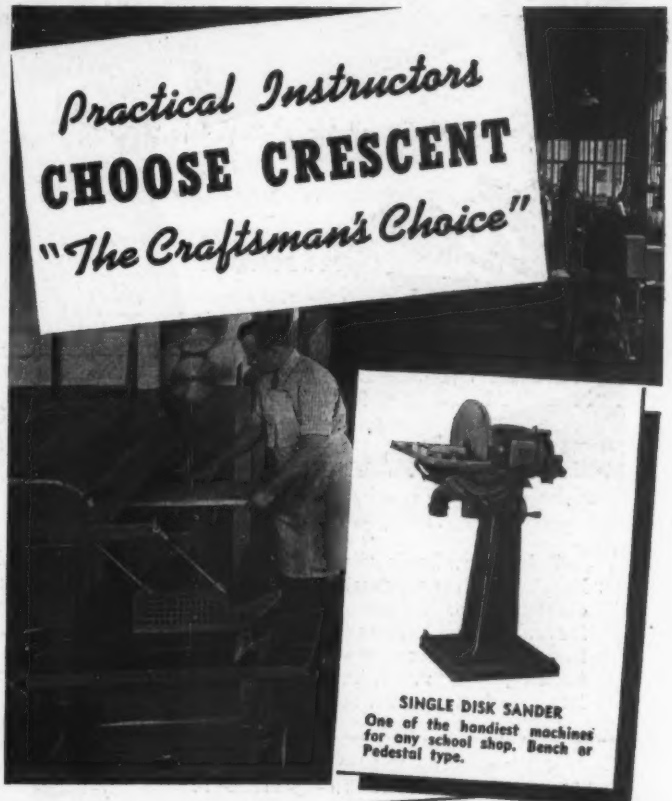

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Heavy-Duty Planer

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HEAVY-DUTY PLANER

Heavy well-ribbed cast-iron frame. Table one-piece, heavy ribbed casting. Feed rolls machined from solid bar steel. Heavy-duty ball bearings with alemite fittings. Cutter head turned and machined from heavy bar steel. Special cast-iron base. Sturdy, accurate, economical.

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PERTINENT PARADOXES

(Continued from page 34A)

are coming to adopt the same attitude of self-examination utilized to eradicate defects in industry and produce satisfactory, serviceable results. Expenditures are made to see that children enter school in good state of health, and vigilance is maintained over their health and safety during their entire school career.

Such a program cannot be attempted without substantial school buildings with adequate equipment and properly controlled heat, light, and ventilation. These things likewise cost money, but if carefully and appropriately chosen and wisely used, represent an investment of infinite value to the community. We may be grateful to a publication such as this which sets forth in authentic form the specifications of school equipment which may be utilized for this sound and fundamental purpose.

Industrial education and other forms of vocational education seem to have the strongest possibilities for the constant detection and elimination of defects which stand in the way of good results. Kinds and conditions of work in these fields are conducive to clear and accurate thinking, and are not likely to produce complex maladjustments within the individual. The procedures are such as to aid in habits of regular preparation and orderly advancement. The material product leaves no doubt as to its quality, and the ability of the human product to fit into the affairs of life can be definitely demonstrated. Thus this great branch of educational endeavor may serve to clear up some of the conflicting beliefs between the cost and value of the schools, may serve our nation in this time of grave crisis, and insure a future free from the influences which stifle human life, liberty, and happiness.

PERSONAL NEWS

♦ H. C. Rose, formerly of the high school, West Allis, Wis., has been appointed to the faculty of the Southern Illinois State Normal School, Carbondale, Ill.

♦ Graydon Hardy, former principal of Stair Technical High School, Knoxville, Tenn., was recently appointed district supervisor of trade and industrial instruction for the Tennessee State Board of Education. His territory will cover all counties in the state east of Knoxville. His duties will be largely to increase interest in technical courses pertaining to National Defense Training.

♦ Wilson New is succeeding Graydon Hardy as principal of the Stair Technical High School, Knoxville, Tenn.

♦ H. G. Leet was recently added to the staff of the Kansas State Board for Vocational Education as an assistant supervisor for trade and industrial education. Mr. Leet has been an instructor of general metalwork at El Dorado, Kans., and has been in charge of the evening school program. He will now have direct charge of the NYA related-subjects program and a part of the Rural and Non-Rural National Defense Program. His headquarters will be at the Pittsburg Branch Office.

♦ G. W. Day has been appointed to succeed H. G. Leet as evening school director at El Dorado, Kans.

♦ W. E. Clark, co-ordinator of trade and industrial education at Kearney, Neb., has resigned to take up the duties of assistant instructor in the air corps technical school at Chanute Field, Rantoul, Ill.

Mr. Clark was head of the industrial-arts department of the Cramer High School at Columbus, Neb., from 1929 to 1938 and then spent two and one half years as co-ordinator at Kearney, before taking up his present position at Chanute Field.

♦ Charles R. Kinison, associate professor of industrial arts at Ohio University, Athens, Ohio, has been granted leave of absence for the remainder of the college year to enroll at the University of Missouri, Columbia, Mo., to complete the work required for his doctoral degree.

♦ Douglas W. Clausen, graduate of Stout Institute and the University of Wisconsin, will assist in the department of industrial arts at Ohio University, Athens, Ohio, while Charles R. Kinison, associate professor of industrial arts, is away on leave of absence.

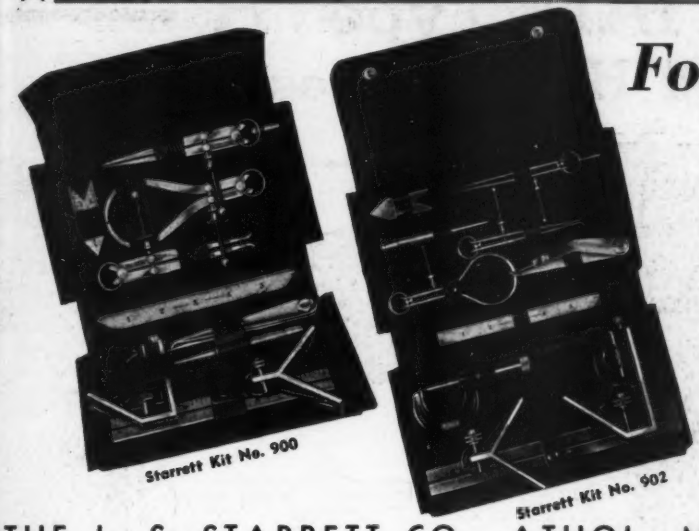
♦ Albert Ersche, formerly instructor in freehand drawing at the St. Paul Vocational School, St. Paul, Minn., is now devoting his entire time to the instruction of cabinetworkers.

♦ Fern C. Brensike is teaching the freehand drawing course at the St. Paul Vocational School. The course will be divided into three units varying in degrees according to the ability of the students.

♦ Mr. Driver has recently been appointed instructor of carpenter shop at the St. Paul Vocational School, St. Paul, Minn.

♦ Appointment of Leo B. Jacobs as State Youth Administrator for Ohio, succeeding S. Burns Weston, has been announced by Aubrey

(Continued on page 41A)



For DEFENSE Training

The new emphasis on precision metal working in industrial education makes adequate precision tool equipment essential. These Starrett Student Kits provide a carefully selected, well balanced set of essential measuring tools. They are all genuine Starrett Tools, made to Starrett standards of accuracy and workmanship yet priced to fit school shop budgets. See them at your tool dealer's. Write for Catalog No. 26-CE.

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World's Greatest Toolmakers

Precision Tools . . . Dial Indicators . . . Ground Flat Stock . . . . . Hacksaws . . . Metal Cutting Bandsaws . . . Steel Tapes

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(Continued from page 38A)

Williams, Administrator of the National Youth Administration.

Mr. Weston was recently appointed to the position of Assistant to the Chairman of the National Advisory Committee of the National Youth Administration and his headquarters will be in Washington. Weston directed the NYA in Ohio from the inception of the program in 1935 to November, 1940.

♦ GILBERT O. ROBINSON, of Senath, Mo., has been appointed State Youth Administrator for Missouri. He will succeed C. Clark Buckner who has resigned.

♦ HUBERT KOLEMAINEN, formerly of Comstock High School, Comstock, Mich., has been given charge of the woodwork department of South High School, Grand Rapids, Mich., taking the place of John Jenson, retired.

♦ EUGENE HALVORSON, graduate of Stout Institute, Menomonie, Wis., is now teaching industrial arts at the school in Merrill, Wis.

♦ NORBERT METTELKA, another graduate of Stout Institute, has just begun the teaching of metalwork in the junior high school at Flint, Mich.

♦ L. K. COVELLE, state supervisor of trades and industries education for Oklahoma, has been granted a year's leave of absence by the state board of education to serve in the navy.

♦ WALTER E. RUPP, of Excelsior, Minn., has accepted a position as printing instructor in the Woodward High School, Cincinnati, Ohio, beginning the second semester.

ASSOCIATION NEWS

COMING CONVENTIONS

Connecticut Industrial Arts Association, March 14–15, at New Britain, Conn. Pres., Eugene Giammatteo, 17 Putnam St., Bristol, Conn. Secy., John A. Whitesel, Teachers College of Connecticut, Bristol, Conn.

Illinois Vocational Association, March 27–29, at Rockford, Ill. Pres., James M. Thompson, Teachers College, Charleston, Ill. Secy., H. P. Erwin, Sullivan High School, Sullivan, Ill.

New Jersey Vocational and Arts Association, March 27–29, at Asbury Park, N. J. Pres., Dr. Ronald Kent, Hall of Record, Newark, N. J. Secy., J. J. Berilla, 553 Corliss Ave., Phillipsburg, N. J.

Indiana Industrial Education Association, March 28–29, at W. Lafayette, Ind. Pres., Marvel Moore, Richmond Public School, Richmond, Ind. Secy., H. G. McComb, Purdue University, W. Lafayette, Ind.

Nebraska Industrial Arts Teachers Association, March 28–29, at Lincoln, Neb. Pres., L. G. Lindahl, State Teachers College, Chadron, Neb. Secy., G. O. Trogdon, High School, Gering, Neb.

Eastern Arts Association, April 16–19, at New York, N. Y. (Pennsylvania Hotel). Pres., Elmer A. Stephan, Board of Education, Pittsburgh, Pa. Secy., Raymond P. Ensign, 250 E. 43rd St., New York, N. Y.

Kentucky State Industrial Arts Association, April 18, at Louisville, Ky. Pres., David M. Wherry, Dayton High School, Dayton, Ky. Secy., Edgar Mara, Holmes High School, Covington, Ky.

California Industrial Education Association, April 19, at Fresno, Calif. Pres., James E. Welden, Fresno City Schools, Fresno, Calif. Secy., Samuel L. Fick, Univ. of Calif., Los Angeles, Calif.

A.V.A. CONVENTION

(*Concluded from page 23A, February, 1941,* INDUSTRIAL ARTS AND VOCATIONAL EDUCATION)

The Agricultural Education section were the guests of the Sears Roebuck Co. on a very instructive, enjoyable, and educational tour of the North Bay area. This trip took about 10 hours.

At the Monday morning session, R. M. Stewart, professor of rural education, Cornell University, Ithaca, N. Y., presided. F. W. Lathrop, research specialist in agricultural education, U. S. Office of Education, Washington, D. C., discussed the research in the history of agricultural education; H. E. Lattig, University of Idaho, Moscow, Idaho, spoke on "Farm Youth as a Vantage Point"; and Roy A. Davenport, Louisiana State University, Baton Rouge, La., described the program of the department of vocational agriculture. H. M. Byram, Michigan State College, East Lansing, Mich., gave an evaluation of agricultural education in secondary schools.

William Kerr, state director of vocational edu-

(Continued on page 42A)

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Geared Head Lathes

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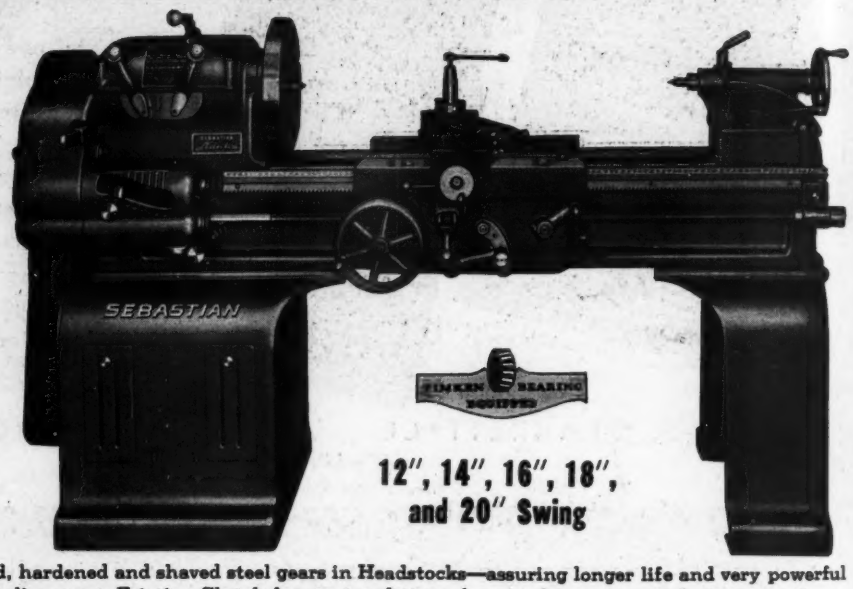
THE MOST OUTSTANDING VALUE IN ITS PRICE FIELD



12", 14", 16", 18", and 20" Swing

Notable among the many desirable features of Type H Sebastian Lathes are the Eight Speed geared Headstock with Timken Bearings on all shafts—assuring accuracy and from 15% to 20% more power; Oversized heat treated, hardened and shaved steel gears in Headstocks—assuring longer life and very powerful head; Accuracy .0005" at every point of alignment; Friction Clutch for start and stop of main drive, mounted conveniently on headstock.

Write now for prices and complete detail

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(Continued from page 41A)

cation, Boise, Idaho, presided at the afternoon session. At this meeting L. R. Humphreys, department of agricultural education, Utah State College, Logan, Utah, gave a progress report on an evaluation study that had been made.

L. R. Humphreys also acted as chairman at the Tuesday morning session at which Sherman Dickinson, professor of agricultural education, University of Missouri, Columbia, Mo.; J. A. Guitteau, state supervisor of agricultural education, Olympia, Wash.; S. S. Sutherland, department of agricultural education, University of California, Davis, Calif.; and C. G. Howard, State A. and M. College, College Station, New Mexico, discussed the "Selection of Personnel to be Trained." J. W. Hull, president, Arkansas Polytechnic College and N.Y.A. State Administrator, spoke on the "Cooperation Between Vocational Agriculture Teachers and the N.Y.A. in Organizing and Teaching Part-time Classes."

At the Wednesday morning session, Julian A. McPhee, chief, Bureau of Agricultural Education, California Polytechnic School, San Luis Obispo, Calif., presided. The problem of the placement of young men on farms was discussed by R. W. Gregory, vocational division, U. S. Office of Education, Washington, D. C.; J. B. McClelland, department of agricultural education, Iowa State College, Ames, Ia.; and A. K. Getman, state supervisor of agricultural education, Albany, N. Y. H. C. Ramsower, administrative assistant, Advisory Commission to Council on National Defense, Washington, D. C., spoke on "The Part Rural Youth Can and Should Play in National Defense."

The Monday morning session of the Industrial Educational Session took up *apprentice training*. George H. Fern, director, State Board of Control for Vocational Education, Lansing, Mich., presided. The first speaker C. A. Prosser, director, William Hood Dunwoody Industrial Institute, Minneapolis, Minn., chose for his subject, "Conservation of Trade Skills for Continuous National Defense Through Apprentice Training." E. H. Vernon, International Association of Machinists, Los Angeles, Calif., discussed "Strengthening Apprentice Training in the Machine Trades for National Defense," and R. Randall Irwin, industrial relations manager, Lockheed Aircraft Corp., Burbank, Calif., explained, "Apprentice Training in the Aviation Industry for National Defense." H. G. Halstead, acting state director of vocational education, Olympia, Wash., was the discussion leader at this meeting.

James R. D. Eddy, state director of industrial education, Austin, Tex., was the chairman at the Monday afternoon session. The main subject for discussion at this meeting was *Training for Essential Industries Under the National Defense Program*. The speakers were: Lt. Col. Frank J. McSherry, administrative assistant, Labor Supply Division, Advisory Commission to Council of National Defense, Washington, D. C.; A. S. Boynton, state director of vocational education, Hartford, Conn.; George Fern; L. K. Covelle, state supervisor of industrial education, A. and M. College, Stillwater, Okla.; Harry Tiemann, state director of vocational education, Denver, Colo.; and J. C. Beswick, chief, Bureau of Trade and Industrial Education, Sacramento, Calif. James R. D. Eddy, was the discussion leader.

At another meeting Monday afternoon *Modern Types of Vocational School Buildings and Equipment for Trade and Industrial Education* were discussed. Mrs. Eunice Harrison, principal, Middlesex County Girls' Vocational School, Woodbridge, N. J., described "A Girls' Vocational School, Incorporating Special Features in Building and Equipment"; Charles W. Sylvester, director of vocational education, Baltimore, Md., discussed, "A Modern Vocational School Building Serving a Large Metropolitan District"; Carl T. Cotter, director of vocational and industrial education, Toledo, Ohio, gave an interesting talk on "Modern Types of Vocational Trade School Buildings and Equipment"; and "Vocational School Equipment" was discussed by Howard K. Hogan, special representative, Trade and Industrial Education for Defense Workers, U. S. Office of Education, Washington, D. C., and G. F. Malick, director of vocational education, Canton, Ohio.

Part-time education was discussed at the Tuesday morning session of the Industrial-Education Section. E. C. Jeppson, director of vocational education, Utah State Agricultural College, Logan, Utah, presided. Robert L. Welch, state supervisor of trade and industrial education, Madison, Wis., spoke on "Part-Time Education and National Defense"; "Junior Employment and the Wage-Hour Laws" was discussed by John Davidson, chairman, State Board of Industrial Relations, Vallejo, Calif.; Thomas A. Diamond, teacher trainer, University of Michigan, Ann Arbor, Mich., spoke for, and R. W. Kent, assistant director, Essex County Vocational Schools, Newark, N. J., spoke against the question, "Training of Youth at this Time Should Specifically Point Toward Preparation for Meeting the Needs of National Defense."

At the Wednesday morning meeting the topic for discussion was, *Labor and Industrial Management*. J. C. Beswick presided. The speakers at this meeting were: J. C. Reynolds, business manager, Alameda County Building Trades Council; W. P. Bell, personnel manager, California-Hawaiian Sugar Refining Corp., and R. Randall Irwin. Layton S. Hawkins, chief, industrial education service, U. S. Office of Education, Washington, D. C., then summed up the presentations.

At another session on Wednesday morning, the *Objectives and Problems in Diversified Occupations Program* were discussed by a panel. The chairman was W. D. Gardner, state supervisor of trade and industrial education, Jackson, Miss.,

(Continued on page 52A)

Metalworking Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

Air Compressors — for machine shop, foundry, or forge shop
Anvil — 100-lb.
Arbor Press — bench or pedestal type
Barrows
- a) Coke
- b) Foundry
- c) Scrap

Belt Lacer
Benches
- a) Coremaking
- b) For metal working, iron or steel legs. Tops, metal or hardwood lumber, 1¾ in. to 2½ in. thick
- c) Molding

Blackboard — permanent or portable
Blowers — for furnaces, forges, etc.
Blowtorch — 1 qt. size
Bookcase — for reference books, catalogs, etc.
Boring Bar
Boring Mill — vertical or horizontal
Bulletin Board
Cabinets — Wood or metal, for filing class records, instruction sheets, drawings, etc., and for tools and supplies
Casehardening Boxes
Centering Machine
Chain Hoists — differential, duplex or triplex
Chairs — teacher's and tablet-arm, if needed for related-subjects room, or for demonstration section
Chuck
- a) Drill, selected sizes
- b) Lathe, combination, 4-jaw, selected sizes
- c) Lathe, independent, 4-jaw, selected sizes
- d) Lathe, universal 3-jaw, selected sizes
- e) Milling machine, universal

Core Oven — for foundry
Cranes and Hoists — air, electric or hand, of the jib, traveling, or portable type
Cupola — for foundry, coke, or electric, ¼ to 1-ton capacity
Desk — teacher's, with drawer compartments
Die-Filing Machine
Dividing Head
Drills
- a) Bench, hand
- b) Breast
- c) Electric, portable
- d) Hand
- e) Post, hand or power
- f) Radial
- g) Sensitive
- h) Upright, power

Flasks — 2 or 3 part, steel or snap type
Forge — coal or gas, with hand or electric-driven blower
Furnaces
- a) Annealing
- b) Bench
- c) Brass and soft metal
- d) Combination bench
- e) Casehardening
- f) Cyanide
- g) Gasoline
- h) Heat treating
- j) Melting

Gear-Cutting Machine
Grinder
- a) Bench, hand or power driven
- b) Combination grinder, buffer and polisher
- c) Emery, bench or pedestal type
- d) Face, with magnetic chuck
- e) Portable tool post
- f) Precision, for external and internal grinding
- g) Universal tool cutter, drill and reamer grinder
- h) Wet tool

Hack Saw — motor or belt driven
Hand Picks — for cleaning inside of cupola, 1¼ to 2½ lb.
Hardness Testing Machine
Lathes — belt or individual drives
- a) Automatic
- b) Bench, 6 in. to 11 in. swing, 11 in. to 36 in. between centers
- c) Change gear, 9 in. to 14 in. swing, 18 in. to 36 in. between centers
- d) Quick-change gear, 9 in. to 16 in. swing, 18 in. to 36 in. between centers
- e) Semiquick-change gear, 9 in. to 18 in. swing, 18 in. to 42 in. between centers
- f) Turret
- g) Metal spinning

Milling Machine
- a) Plain, cone or motor-driven type
- b) Universal, cone or motor-driven type

Nibbling Machine
Pipe Cutter
Planer — belt or motor driven
Power Hammer — for forging operations
Punches — metal, hand, or power
Pyrometer
Pyroscope
Relieving Attachment for Lathe
Sand Sifter — for foundry, hand or power
Sandblast Outfit — with cabinet
Scale
- a) Counter for machine shop
- b) Platform, for foundry, 1000-lb. capacity

Shaper
Snap-Flask Jackets — to fit snap flasks used
Straightening Press
Surface Plates
Swage Block and Stand — for forge shop
Taper Attachment for Lathe
Truck — warehouse
Tumbling Barrel — for foundry
Vises
- a) Blacksmith
- b) Drill press
- c) Machinist
- d) Pipe
- e) Planer
- f) Shaper

Welding Outfit
- a) Acetylene
- b) Electric

Metalworking—Small Tools

Arbors
- a) Drill chuck to suit requirements
- b) Reamers, various sizes
- c) Shell tool, various sizes
- d) Straight shank for shell reamers and shell drills, selected sizes
- e) Taper shank for shell reamers and shell drills, selected sizes

Bearing Scraper
Bellows — for foundry class
Bevel Protractor
Brooms and Floor Brushes — for shop and foundry
Brushes
- a) Bench
- b) Core box
- c) Core painting
- d) Hard brushes for foundry
- e) Floor
- f) Soft brushes for foundry

Bulb Sponges — for molders
Draw Pins — for molders
Calipers
- a) Hermaphrodite, 4 in. and 6 in.
- b) Inside, 4 in. and 6 in.
- c) Outside, 4 in. and 6 in.

Cans
- a) Oil, 1/3-pt., 1-pt., and 10-gal.
- b) Waste

Center Testers
Chisels
- a) Cape, 3/8 in. and 5/8 in.
- b) Cold, 5/8 in. and ¾ in.
- c) Diamond point, 3/8 in. and ½ in.
- d) Round nose, 3/8 in. and ½ in.

Clamps
- a) 4 in., 6 in., 8 in., and 10 in.
- b) Flask, for foundry
- c) Strap, various sizes

Coke Forks — for foundry
Collets
- a) For milling machine, selected sizes
- b) For lathe, selected sizes

Combination Squares — with hardened head and blade, and protractor head, 9 in. and 12 in.
Counterbores — straight and tapered shanks, selected sizes
Countersinks — for metal
Crucible Tongs — to fit crucibles
Crucibles — selected sizes
- a) Shanks, single-end to fit ladles
- b) Shanks, hand, to fit ladle bowls

Cutters — angular-milling, bevel-gear, concave-milling, convex-milling, end-milling, face-milling, formed-milling, grooving, involute gear teeth, key-seat, side-milling, and metal-slitting

Dividers — Spring, 4 in. and 6 in.

(Continued on page 46A)

(Continued from page 45A)

a) Drifts, different sizes
b) Drill sleeves, different sizes
c) Stand for Nos. 1 to 60
d) Stand for 1/16 in. to ½ in. by 64ths

Drills
a) Center
b) High-speed, taper shank, various sizes
c) Jobbers, straight shank, 1/16 in. to ½ in. by 64ths
d) Ratchet
e) Straight shank, Nos. 1 to 60
f) Taper shank, ½ in. to 1 in. by 16ths

File Cards

Files
a) Die sinkers, various shapes
b) Flat bastard, 8 in. and 10 in.
c) Half-round, double cut, 6 in., 8 in., and 10 in.
d) Hand, smooth, 8 in. and 10 in.
e) Mill, smooth, 8 in. and 10 in.
f) Round bastard, 8 in.
g) Square bastard, 8 in.
h) Swiss, various shapes
j) Three-square, double cut, 6 in.
k) Warding, double cut, 6 in.

First-Aid Cabinet and Supplies

Forge Tools — drift pins, flatters, fullers, hand and handle punches, hardies, hot and cold cutters, set hammers, and swages for the forge shop

Gate Sticks — maple, for foundry

Gauges
a) Center
b) Depth
c) Drill and wire
d) Screw pitch, select kinds
e) Surface

Gloves — asbestos, for foundry

Goggles
a) For machine shop
b) For foundry

Hack Saw
a) Blades, hand, 18T, 10 in.
b) Blades, power, 14T, 12 in.
c) Frames, adjustable

Hammers
a) Babbitt
b) Ball-peen, 13-, 16-, or 20-oz.
c) Blacksmith's, various kinds
d) Riveting, 9- and 12-oz.
e) Setting

Indicator
a) Center
b) Universal or universal dial test
c) Speed

Knurling Tool — with assorted knurls

Ladles
a) Bull
b) Hand bowls
c) Melting

Lathe Dogs — ½ in., ¾ in., 1 in., 1½ in., 2 in., 2½ in., and 3 in.

Leggings — fireproofed duck, to protect students when pouring in foundry

Level — 6 in. bench

Lifting Screws — for molders

Mallets — wood or soft

Mandrels — selected sizes

Micrometers — inside, 1½ in. to 8 in.; outside, 0 to 1 in.; outside, 1 in. to 2 in.; outside, 2 in. to 3 in.

Molding Boards

Molding Sticks and Trowels — various kinds

Nippers — end-cutting, 5 in.

Oil Storage Tank — with pump

Oilstones — medium and fine

Pails — galvanized, 12-qt. capacity for foundry

Parallels
a) Adjustable
b) Steel, assorted sizes

Pliers
a) Combination, 6 in.
b) Side-cutting, 6 in.

Punches
a) Center, ¼ in. and ⅜ in.
b) Hollow, ½ in., ¾ in., and 1 in.
c) Pin, ⅛ in., 5/32 in., 3/16 in., 7/32 in., and ¼ in.
d) Prick, ¼ in.

Rammers — for foundry
a) Hand
b) Floor

Reamers — various sizes
a) Adjustable
b) Hand
c) Taper pin
d) With taper shank

Riddles — ¼ in. and ⅜ in. mesh, 18 in. diameter, for foundry

Rivet Sets — assorted sizes

Scales
a) Steel, 6 in., graduated 1/64 in. to ½ in.
b) Steel, 12 in., graduated to 32nds

Screw Drivers — 6 in. and 9 in. blade

Scribers

Shovels
a) Coke
b) Sand

Snips — tin, 3 in. straight and 3 in. curved

Sockets — for taper shanks, drill and tools, selected sizes

Soldering Coppers and Handles — 1-lb. size

Spray Can — for molders

Sprinkling Cans — galvanized iron, 16-qt. capacity, for foundry

Sprue Picks — for molders

Squares
a) Machinists', 6 in.
b) Blacksmith's

Steel Figures, ⅛ in.

Steel Letters — ⅛ in.

Swabs — for molders

Tapeline — steel, 25 ft.

Taps and Dies
a) Machine screws
b) Pipe
c) S.A.E. ¼ in. to ¾ in.
d) U.S.S. ¼ in. to ¾ in.

Tongs
a) Blacksmith's, various kinds
b) Pick-up, for foundry
c) Shake-out, for foundry

Tool Holders
a) Boring tools
b) Cutting-off tools
c) Planer
d) R.H. and L.H. offset shank
e) Shaper
f) Slotter
g) Straight shank
h) Threading

Tool-Holder Bits — square, ¼ in., 5/16 in., ⅜ in., 7/16 in., ½ in.

Trammel Points

V Blocks and Clamps

Wheel Dresser

Wrenches
a) Adjustable, 8 in. and 10 in.
b) Pipe, 8 in. and 12 in.
c) Tap, adjustable, various sizes

Metalworking—Materials and Supplies

Abrasive cloth — aluminum oxide. Grits 320 to 24, obtainable in sheets or rolls from 1 to 28 in. wide

Abrasive Wheels

Acetylene Gas — in drums for welding

Aluminum
a) Pigs for foundry
b) Sheets, tubing, rounds, shapes, wire, etc.

Babbitt Metal

Bearing Blue

Belt Dressing

Belt Lacing Material

Belt Leather

Bolts
a) Carriage, selected sizes
b) Lag, selected sizes
c) Machine, selected sizes
d) S.A.E., selected sizes
e) Stove, flat or round heads, selected sizes

Brass
a) Bars, 3/32 in., ⅛ in., 4/16 in., and ¼ in. thick; ⅜ in. to 1 in. wide, 8 ft. to 10 ft. long, selected sizes
b) Round rods, 3/16 in. to ½ in. by 16ths, selected sizes
c) Sheets, 28 to 32 American gauge, 12 in. wide x 72 in. to 84 in. long, selected sizes
d) Strips, 1/32 in. and 1/16 in. thick, ½ in. to 1½ in. wide, 50 ft. to a coil, selected sizes
e) Threaded rods, Nos. 6 to 10, in 24 in. lengths. Nos. 12, 14, ¼ in., and 5/16 in., in 24 in. lengths, selected sizes
f) Wire, soft, 8, 11, and 14 American gauge, selected sizes
g) Wire, spring, 8 to 22 American gauge, selected sizes

Casehardening Compounds

Chaplets — single and double head

Coal
a) Charcoal for foundry or forge
b) Coke for foundry
c) Forge

Copper
a) Pigs, for casting alloys
b) Sheets, 8 to 25 American gauge, 30 in. x 60 in., selected sizes
c) Tubing, outside diameters, 3/16 in., ¼ in., 5/16 in., ⅜ in., ½ in.; thickness of wall, 1/32 in.; lengths, 8 ft. to 12 ft., selected sizes
d) Wire, soft, 2 to 20 American gauge, in coils. Also in ¼-, ½-, and 1 lb. spools, sizes 16 to 36, English gauge, selected sizes

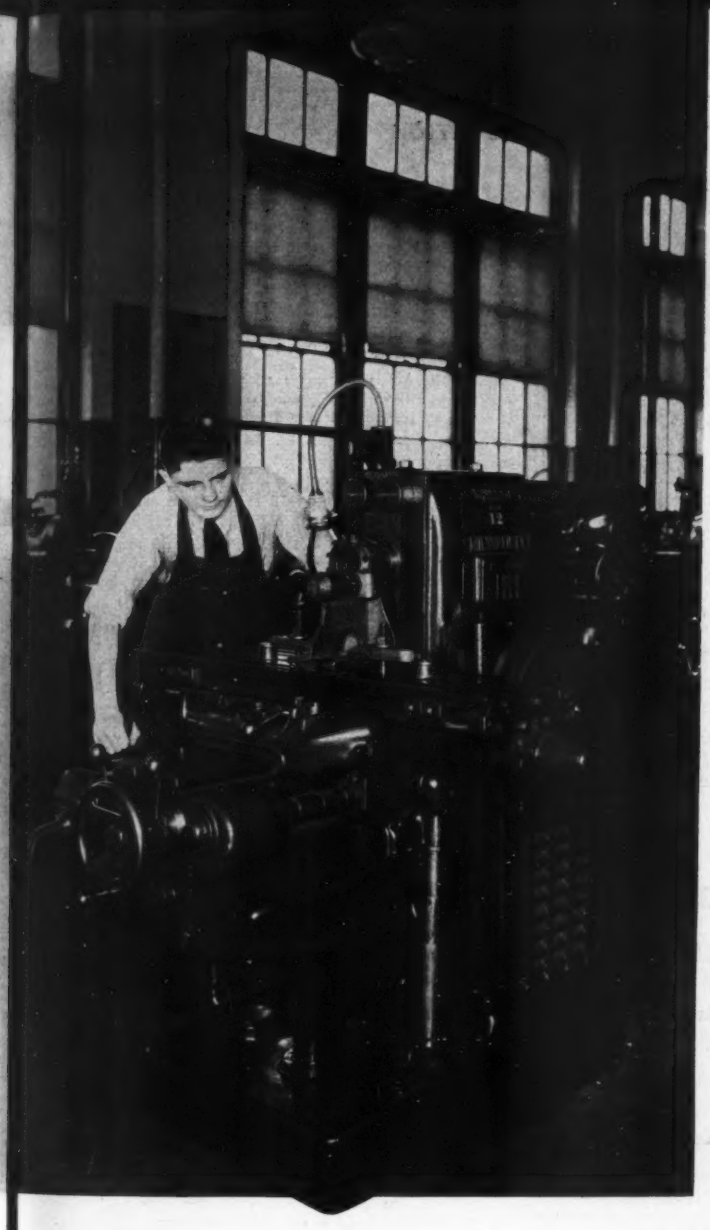
Core
a) Compounds
b) Flour
c) Paste
d) Oil
e) Wax-vent wire

Cutting Compounds

Fire Bricks and Clay — for foundry

Fire Handles — assorted sizes

(Continued on page 48A)



MODERN DESIGN BUILT-IN SAFETY

Preferred FOR TECHNICAL INSTRUCTION BY LEADING EDUCATIONAL INSTITUTIONS

Ideal for all phases of classroom work — embodying many features of advanced design found only in larger machines — Milwaukee Milling Machines are the usual choice of leading educational institutions.

Adapted to the most inexperienced operators because of their built-in safety interlocks (when hand controls are engaged, power controls cannot be thrown in) — low in height — all controls centralized and finger touch — Milwaukee Machines are preferred by most technical and vocational schools and colleges. Technical instructors may avail themselves of catalogs, bulletins, framed wall photos, speed charts and other materials which we will send without obligation. Write for special literature and bulletin No. 725.

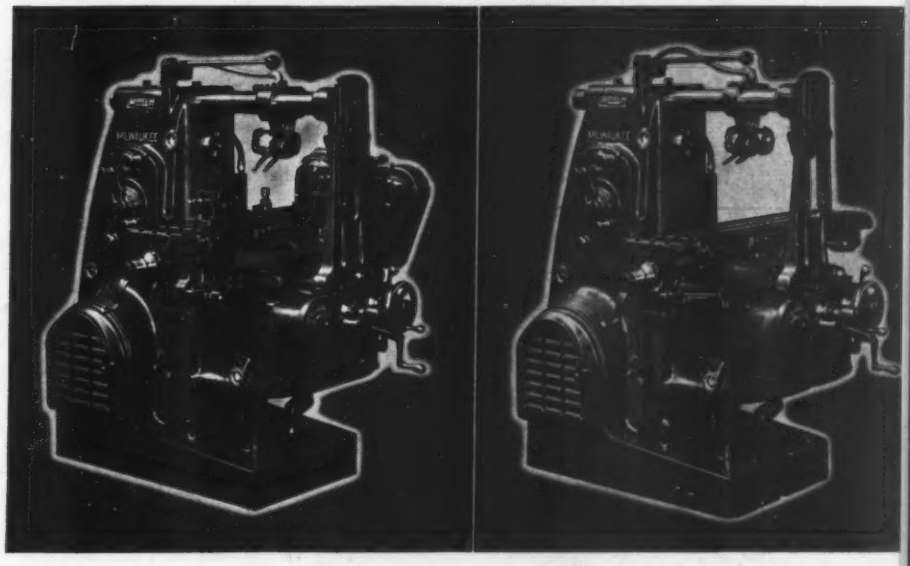
KEARNEY & TRECKER COMPANY
Milwaukee, Wisconsin

Model 1-H and 2-HL, Universal Type

(Left) Finger-touch safety controls . . . the famous K & T Double Overarms . . . directional feed levers . . . plus other perfected features.

Model 1-H and 2-HL, Plain Type

(Right) Compact, complete — with all tried and tested features usually found only in larger machines . . . low in height . . . minimum floor space . . . full back column . . . centralized controls.



MILWAUKEE MILLING MACHINES

Group Type Wash Fixtures Ideal For School Shops, Too

Handy washing facilities encourage cleanliness. Hundreds of schools and institutions, large and small, are equipped with group type wash fixtures such as Bradley Washfountains which provide clean, sanitary *running water* for each person from a central sprayhead. No chance of contamination since the bowl is self-flushing.

One Washfountain while serving 8 to 10 simultaneously, requires no more piping connections than a single-person basin, reducing installation and maintenance expenses. Water consumed is 70% less . . . For further information on modern group type wash fixtures, write for our new 1941 Catalog. BRADLEY WASHFOUNTAIN CO., 2269 W. Michigan Street, Milwaukee, Wisconsin.

Write for new 1941 Catalog

BRADLEY WASHFOUNTAINS

(Continued from page 46A)

Graphite — for foundry
Iron — Pig, for foundry
Lacquer — transparent and colored, for finishing
Nuts — S.A.A., acorn cap, castellated, square, hexagon, joint, and wing, selected sizes and kinds
Oil
- *a*) Boiled linseed
- *b*) Lubricating
- *c*) Quenching and hardening

Packing
Round, sheet, square, or tubular
Paint — black asphaltum
Pins
- *a*) Cotter, 3/32 in. to ¼ in. diam. from ½ in. to 2 in. long
- *b*) Flask, for flask repairs
- *c*) Taper, Nos. 0 to 6, ¾ in. to 2 in. long

Pumice Powder
Rivets
- *a*) Copper, with burrs, Nos. 7 to 14, lengths, ⅜ in. to ¾ in., selected sizes
- *b*) Iron, No. 14 gauge to 3/16 in., flat-head or button-head, ¼ in. to 1 in. long, selected sizes
- *c*) Tinners', flat-head, 8-oz. to 16-lb., either tinned or black, selected sizes

Sand
- *a*) Molding, in 350-lb. barrels or 800-lb. casks
- *b*) Parting, in 350-lb. barrels or 800-lb. casks

Screws
- *a*) Flat-head or round-head iron or brass, selected sizes and kinds
- *b*) Cap and machine, iron or brass, selected sizes and kinds
- *c*) Set, head and headless

Solder — acid or rosin core; bar, or solid wire
Soldering Paste or Salts
Steel
- *a*) Bessemer, rod, 1/64 in. to ⅜ in. by 64ths, in 4 ft. lengths, selected sizes
- *b*) Bars, cold-rolled, ⅛ in. to ⅜ in. thick, ½ in. to 2 in. wide, 12 ft. lengths, selected sizes
- *c*) Drill rod, letter sizes, A to Z, number sizes, 1 to 80, in 3 ft. lengths, selected sizes
- *d*) Rods, hexagon and square, cold-rolled, ¼ in. to ¾ in., in 12 ft. lengths, selected sizes
- *e*) Round, cold-rolled, diameters ⅛ in. to 1 in., lengths 12 ft., selected sizes
- *f*) Sheet, black, Nos. 18, 20, 22, 24, 26, 28 U.S. gauge; size of sheets, 24 in., 28 in., and 30 in. x 96 in.
- *g*) Sheet, galvanized, Nos. 18, 20, 22, 24, 26, 27, and 28 U.S. gauge; size of sheets, 24 in., 28 in., and 30 in. x 96 in., selected sizes
- *h*) Threaded rods, Nos. 6 to 10, in 12 in. lengths. Nos. 12, 14, ¼ in., and 5/16 in., in 24 in. lengths, selected sizes

Tin
- *a*) Pigs, for casting alloys
- *b*) 1C, 1X, 20 in. x 48 in.
- *c*) 1XX, 20 in. x 48 in.

Washers and Burrs
- *a*) Copper, burrs, Nos. 3 to 14, in 1-lb. boxes
- *b*) Iron burrs, Nos. 3 to 14, in 1-lb. boxes
- *c*) Brass washers, 3/16 in. to ½ in. by 16ths
- *d*) Iron washers, 3/16 in. to ½ in. by 16ths

Welding Fluxes
Welding Rods (all rods come in 24 in. lengths)
- *a*) Brazing, 1/16 in., ⅛ in., and 3/16 in. diameter
- *b*) Cast aluminum, 3/16 in., ¼ in., and ⅜ in. diameter
- *c*) Cast brass, 3/16 in., and ⅜ in. diameter
- *d*) Cast bronze, ¼ in. diameter
- *e*) Cast copper, 3/16 in. and ¼ in. diameter
- *f*) Cast iron, 3/16 in., ¼ in., 5/16 in., and ⅜ in. diameter
- *g*) Low carbon steel, ⅛ in., 3/16 in., and ¼ in. diameter

White Lead — for machine shop
Wire
- *a*) Annealed, 16 to 34 English gauge, selected sizes
- *b*) Coppered market, 5 to 18 English gauge, selected sizes
- *c*) Coppered spring, 2 to 18 English gauge, selected sizes
- *d*) Galvanized, 5 to 18 English gauge, selected sizes
- *e*) Piano, Nos. 00 to 36, selected sizes
- *f*) Tinned, 16 to 24 English gauge, selected sizes
- *g*) Wool, Nos. 0 to 3 in 1-lb. packages, selected sizes

Zinc
- *a*) Pigs, for casting alloys
- *b*) Sheet, Nos. 4 to 14, sheets 36 in. x 84 in.

♦ The vocational education program for New Castle, Pa., has been reorganized and expanded. This city now has a thoroughly modern system of vocational education and instruction in industrial arts. Earle M. Cass has been elected director of vocational education and E. O. Delancy, director of guidance. Vocational education in this city in the day school is strictly on the senior high school level.

♦ February 9 to 16, 1941, has been set aside as Negro History Week. The purpose of this is to promote historical research of the negro and his history and to bring about a better understanding and more tolerance between the races.

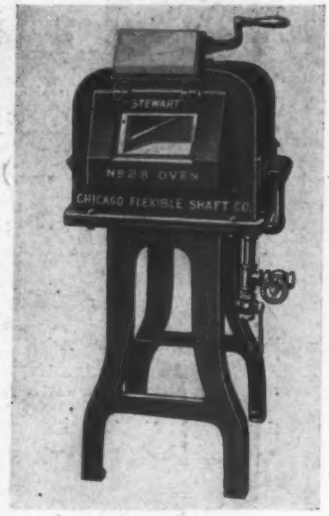
STEWART FURNACES FORGES COMBINATION UNITS STEWART

DESIGNED AND BUILT FOR VOCATIONAL EDUCATION WORK

FAMOUS STEWART No. 28 OVEN FURNACE

This handy, compact, general purpose Furnace is widely used by vocational instructors and for tool-room work. It embodies all the advantages of the Full Muffle Furnace with a reducing or neutral atmosphere easily obtained by regulation of the valves. Inside walls of the U-shaped bottom slab are designed to prevent work being pushed off the slab. Removable plate on rear of furnace to make replacing of slab simple and speedy. Pyrometer opening in rear wall. Lined with first quality refractories. Available for high speed steel work at extra charge with carbofrax hearth and support. Heavy duty STEWART cast iron and welded steel construction.

Door opening 4" x 8" and is 12" deep giving a hearth area 8" x 12".



STEWART No. 28 Oven.

STEWART No. 51 Bench Oven.

STEWART No. 28 BENCH OVEN

This Unit is similar to the No. 28 Oven described above except that it is equipped with short legs for bench use.

Either of these Ovens can be supplied with a counter-balanced door at a small extra charge. Thousands of STEWART 28's have been giving day in, day out service for twenty years or more throughout the country.

STEWART No. 51 BENCH OVEN

Designed for general utility work in school-room or tool-room the STEWART No. 51 Bench Oven is a handy, compact unit handling high speed or carbon steels equally well. Indirect heating does not permit flame to contact work. Carbofrax U-shaped hearth prevents work falling off slab. Highest quality cast iron and steel construction. Opening 3" x 5". Depth 6". Hearth area 5" x 6".

OTHER STEWART OVENS

The complete STEWART Line of Oven Furnaces include all types from the No. 51 Bench Oven with a hearth area 5" x 6" to Car Type, Conveyor and Plate Heating Units with a hearth area 15 feet x 30 feet. STEWART is perfectly equipped to serve you promptly on any requirements along this line. Write for recommendations and prices. Our engineers are at your service without cost or obligation on your part.

STEWART No. SK248 Forge.

STEWART FORGES

No. 3 FORGE

This very popular Forge has an opening 3½" x 8" and a depth of 10". It is frequently used in STEWART Triple and Dual Combination Units.

Cast iron body, base and legs for greatest strength and maximum length of service.

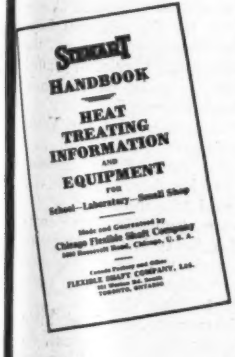
Burners on both sides create combustion immediately over the hearth giving a quick, positive, uniform heat throughout the chamber — quick.

SK248 FORGE

This sturdy STEWART Forge is designed for tool dressing rod end work, welding, center heats and similar purposes requiring a fast high heat. Air curtain in front protects operator. Quenching tank with rack for tongs. The opening is 2" high x 4" wide in front and heating depth 8" and the rear opening 3". A very popular Forge for school and shop work.

STEWART HIGH SPEED STEEL FURNACES

STEWART No. 28 Oven with carbofrax hearth and No. 51 Oven are ideal for high speed steel work where quantities are not large. For special high speed steel work we recommend the No. 3 High Speed Furnace (not shown) with cylindrical combustion chamber with opening 2" x 4" and depth 8". The No. 3 High Speed Steel Unit is frequently made a part of the STEWART Triple or Dual Combination Furnaces.

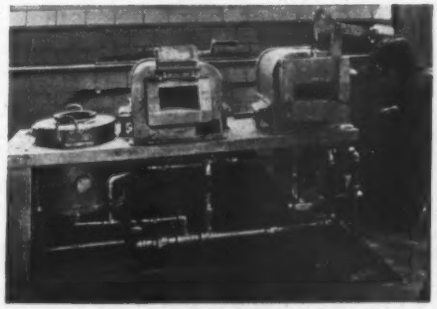


SEND FOR YOUR FREE COPY OF THE FAMOUS STEWART HANDBOOK

A new edition is now available for distribution to classes and will be sent without charge upon receipt of a post card addressed as below.

STEWART SAE STEEL SPECIFICATION WALL CHART

A new edition of the famous STEWART Wall Chart will be ready shortly. Write for your copy of this interesting and informative valuable and up-to-date Chart. The Handbook and the Chart are available without charge. Just drop us a card.



STEWART Triple-Purpose Combination Furnace to be used by both day and night classes of South Vocational High School, Pittsburgh, Pennsylvania.

CHICAGO FLEXIBLE SHAFT COMPANY

Dept. 114, Stewart Industrial Furnace Division

5600 Roosevelt Rd., Chicago, Ill.

32 YEARS MAKING QUALITY FURNACES

SHELDON
Back Geared Screw Cutting
PRECISION LATHES
SHELDON LATHES though low in price are quality machine tools in every detail . . . in design, materials, workmanship and in features.
Made in three sizes (10", 11" or 12" swing) the SHELDON Lathe is just the lathe for your experimental department, repair department or tool room. It is also ideally suited for the manufacturing departments . . . fitted with special tools it is a money maker on second operation work. It can be furnished in many styles and combinations.
Spindles are hardened and ground, inside and out -- even the spindle nose thread is ground. Quick change or Semi-quick Change Gear Boxes. Plain Aprons or Worm Feed Aprons with power Cross Feed
All popular drives.
See the SHELDON
before you buy
Write for Catalog
SHELDON MACHINE CO
1625 N. KILBOURN AVENUE
CHICAGO, U. S. A.

(Continued from page 42A)

and the panel leader, Ralph Barton, district supervisor, trade and industrial education, State Board for Vocational Education, Austin, Tex. The panel members were: C. L. Wetzel, Hadley Vocational School, St. Louis, Mo.; H. A. Huntington, teacher-trainer, A. and M. College, Stillwater, Okla.; O. B. Badger, director of vocational education, Portland, Ore.; Ralph Kenck, state director of vocational education, Bozeman, Mont.; W. H. Cooper, state supervisor of trade and industrial education, Denver, Colo.; and R. B. McHenry, director of vocational education, Tulsa, Okla.

At the Printing Section held Wednesday morning, R. A. J. Porter, Berkeley High School, Berkeley, Calif., presided. The subjects discussed were, "Artistic Principles Applied to Printing," "The Training Program Employed by the Typographical Union and Value of Indentured Apprenticeshop," and "Value of Vocational Education to the Printing Trade." Wallace Kibbee, San Francisco, Calif.; Fred Holderby, president, San Francisco Typographical Union, San Francisco, Calif.; and Alfred E. Baker, principal, Oakland Central Trade School, Oakland, Calif., were the speakers on this program.

The Building Trades Section was presided over by Charles V. Stewart, co-ordinator, trade and industrial education, Santa Cruz High School, Santa Cruz, Calif. The speakers on this program were J. Douglas Wilson, head, building trades department; Frank Wiggins Trade School, Los Angeles, Calif.; A. C. Morgan, carpenter instructor, Technical High School, San Jose, Calif.; and Archie J. Mooney, assistant director of industrial relations, San Francisco, Calif. They discussed the following topics: "Teaching Related and Technical Subjects in the Building Trades," "The Problem of Selection — Whom Should We Train?" and "Apprenticeship in California."

James McDonald, supervisor, trade and industrial education, Contra Costa County Schools, Martinez, Calif., presided over the deliberations of the Automotive Section. The subject for discussion was "The Importance of Auto Mechanics in the United States Army and the Place of Auto Mechanics in the National Defense Program."

At the Monday morning meeting of the Vocational Guidance Section, *state programs* were discussed. J. C. Beswick presided. Nelson B. Sewell, president, Northern California Guidance Association, Salinas, Calif., spoke on "Functions of State Vocational Guidance Programs"; Royce E. Brewster, specialist, Consultation and Field Service, U. S. Office of Education, Washington, D. C., discussed, "The Organization of a State Vocational Guidance Program"; and Roy N. Anderson, assistant professor of education, Teachers College, New York City, explained the operation of a state vocational guidance program. J. Paul Mohr, director of personnel and registrar, San Francisco Jr. College, San Francisco, Calif., was the discussion leader.

At the Tuesday morning meeting the theme was *Training Needs and Resulting Proficiency of Defense Workers*. Gilbert Cuthbertson, director of vocational education, St. Joseph Public Schools, St. Joseph, Mo., was the chairman, and the speakers were: R. T. Craigo, assistant director, William Hood Dunwoody Industrial Institute, Minneapolis, Minn.; Graham R. Miller, acting principal, E. G. Opportunity School, Denver, Colo.; and H. A. Tiemann. The discussion leader on this occasion was Nelson B. Sewell.

The chairman of the Wednesday morning meeting was Edwin A. Lee, School of Education University of California, Los Angeles, Calif. The topic for discussion at this session revolved about *counselling procedures and placement*. The speakers were: Louis V. Newkirk, director, industrial-arts education, Chicago Public Schools; Emily G. Palmer, assistant supervisor in charge of research and service, University of California, Berkeley, Calif.; Creighton E. Hays, supervisor of the Denver Occupational Adjustment Service, Denver, Colo. Heber A. Sotzin, professor of industrial arts, San Jose State College, San Jose, Calif., was the discussion leader.

At the annual banquet held at 6:30 p.m. on Tuesday evening, R. O. Small, president, American Vocational Association, State Department of Education, Boston, Mass., presided. The speaker on this occasion was David Snedden, Palo Alto, Calif., who chose for his subject, "The March of a Harried Two Million."

♦ On Saturday, January 11, 1941, the annual luncheon of the Vocational High School Teachers Association of New York City was held.

A scroll was presented to Charles B. Howe, the retiring acting assistant director of Continuation Schools in New York City.

The toastmaster of the luncheon was Stephen F. Voorhees, chairman of the New York City Advisory Board on Vocational Education.

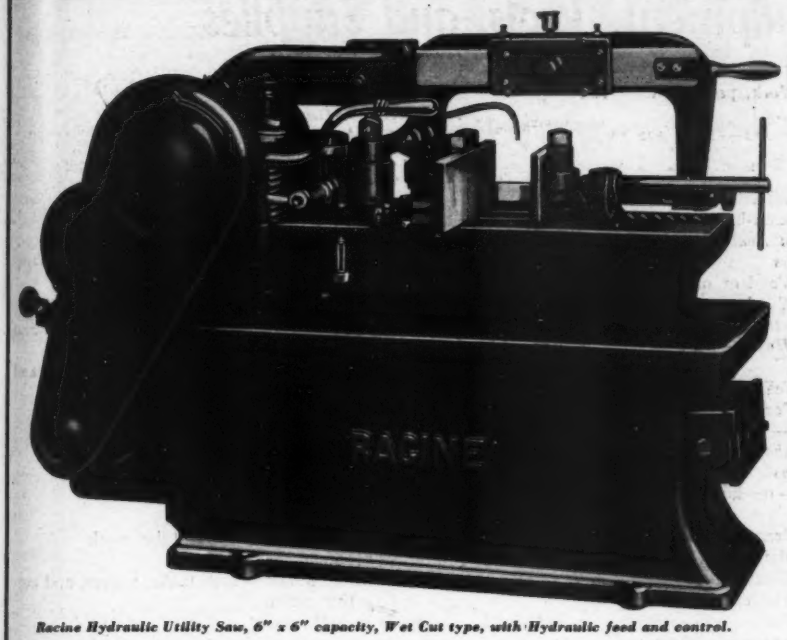
Laurence G. Payson, member of the Council of New York University, spoke on the topic "Vocational Education As Seen By The General Educator," and Layton S. Hawkins, chief of the Trade and Industrial Education Service of United States Office of Education, spoke on the topic "Education and National Defense."

Christopher M. Ryan, president of the Vocational High School Teachers Association, presented a medallion to Mrs. Betty Hawley Donnelly in recognition of her outstanding service to the cause of vocational education.

In his speech of presentation, Mr. Ryan summarized the work of Mrs. Betty Hawley Donnelly with respect to the organization of continuation schools, industrial high schools, evening trade schools, and apprentice training classes.

♦ As a feature of the recent New York State Vocational Association meeting in Syracuse, N. Y., Epsilon Pi Tau had an initiation and banquet program on December 26. Tau Chapter at Buffalo State Teachers College and Phi Chapter at Oswego Normal School, collaborated. The initiation was held at five o'clock in the west mezzanine floor of the Hotel Syracuse for 26 alumni and men in the field.

(Continued on page 66A)



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Our National defense demands well trained men in industry — modern men trained to use modern tools. Racine Hydraulic Utility saws are aiding in this training program in many schools and shops throughout the country. They are found in Navy yards and arsenals, on battleships and air fields — they serve as production saws for the small shop and maintenance or auxiliaries for the large. Use Racine Hydraulic Utility saws in your metal working department. Write for free catalog No. 70-B today.

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TOOL STEEL SIMPLIFIED

By Frank R. Palmer
Assistant to the President
The Carpenter Steel Company

315 pages — 205 illustrations
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Now in use in many vocational and trade schools giving machine shop instruction and in apprentice courses conducted by industrial plants. Elementary enough to be easily understood by beginners. Practical enough to be helpful in retraining adults. Contains hundreds of practical suggestions that can be quickly applied in daily work to get improved tool performance. Send coupon for free descriptive leaflet—or order a book for examination.

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. . . Consider it one of the very finest books that our local schools of vocational and adult education might use in training of apprentices in machine trades.

R. L. Welch
Supervisor Industrial Education
State of Wisconsin

. . . Valuable textbook for apprentices and journeymen, and an equally valuable handbook for tool designers and others concerned with the use of tool steel.

J. B. Chalmers
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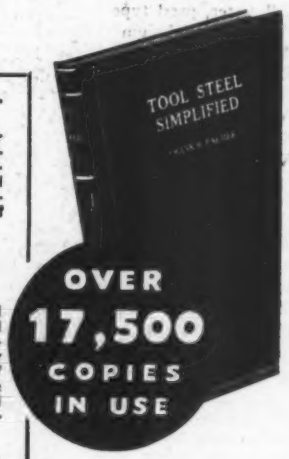
The Yale & Towne Mfg. Co.

. . . Simple and easy to read. Contains useful information which commends it to technical men, semi-technical men, and men in the shops who want to improve their ability to make the best use of tools.

Prof. Bradley Stoughton
Dept. of Metallurgical Engineering
Lehigh University

. . . have read and re-read the book. Became absorbed in finding out and learning so many things I never knew before. Chapter 17 on quenching is worth the price of the book . . . will need 45 copies for classroom use.

F. E. Laverty
Worcester Boys' Trade School
Worcester, Mass.



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Automotive Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

Air Compressor
- a) 3 to 4 cu. ft., with tank, piping, and motor
- b) Small portable, 1 cu. ft., with motor

Aligning Jig — for connecting rods
Anvil
- a) No. 100 or No. 125
- b) Rim

Armature Growler and Tester
Axle Stands
Battery Equipment
- a) Cell tester, panel type with discharge rack
- b) Charger (15-battery size) with rack
- c) Charger (6-battery size)
- d) Gas stove (small)
- e) Lead-burning torches, with gauges and piping
- f) Plate racks

Bench
- a) Electric test, elaborate
- b) Electric test, simple
- c) Work, with vises
- d) Work, portable with vise

Blackboard
Blowtorches — 1-qt. size
Bookcase
Brake
- a) Adjusting stand
- b) Band-lining machine

Bulletin Board
Cabinets
- a) Wood or metal, for bolts and supplies
- b) Wood or metal, for filing job sheets and correspondence

Chain Hoist — with overhead trolley and track
Chairs
- a) Teacher's
- b) For tables, or with tablet arms

Crane — portable
Crankshaft Truing Tool
Creepers
Desk — teacher's
Drill
- a) Breast
- b) Hand
- c) Electric portable, ½ in.
- d) Electric portable, ¼ in.
- e) Press, 21 in., with motor and chuck

Dynamometer — electric
Forge — with blower and tools
Furnaces — gas
Grease Dispensers
Grinder
- a) Cylinder with motor
- b) 8 in., with motor
- c) 12 in., with motor

Hones — cylinder
Jacks
- a) Lever, 1½-ton
- b) Floor, roller

Lathe
- a) 11 in. x 4 ft., with motor, chucks, and attachments
- b) 16 in. x 6 ft., with motor, chucks, and attachments

Press
- a) Arbor
- b) 30-ton

Spray Painting Outfit
Valve Refacing Machine
Vulcanizer
- a) Electric steam for tube work
- b) Small, hand

Welding Outfit — with tanks, gauges, and cutting torch
Wheel Alignment
- a) Gauge
- b) Test table

Automotive Shop—Small Tools

Abrasive — rubstone for cleaning castings in foundry
Alcohol Tester
Battery
- a) Cell tester, prod type
- b) Cell tester, cadmium
- c) Clips, large
- d) Element pullers
- e) Fillers
- f) Funnels, glass
- g) Hydrometer, acid
- h) Knives
- j) Post builders
- k) Post drills
- l) Post markers
- m) Separator trimmer

Bits
- a) Expansive
- b) Ratchet brace
- c) Wood, 3/16 in. to 1 in.

Bolt Cutter — 24 in. and 36 in.
Calipers — 6 in. inside and outside
Cans
- a) Oil, 1/3-pt.
- b) 1-gal., gas, safety
- c) 5-gal., gas, safety
- d) 5-gal., kerosene
- e) Waste

Checks — tool, 1,000, blank
Chisels
- a) Cape, 3/8 in. and 5/8 in.
- b) Cold, 3/8 in., 5/8 in., 3/4 in., 1 in.
- c) Diamond-point

Combination Squares — 12 in.
Cotter-Pin Extractor
Dividers — 6 in. and 10 in.
Drill Sets
- a) 1/32 in. to ½ in., by 64ths
- b) ½ in. to 1¼ in., by 32nds

File Cards
File Handles — assorted
Files
- a) Flat bastard, 6 in., 8 in., 10 in., and 12 in.
- b) Half round, 6 in., 8 in., 10 in., and 12 in.
- c) Mill, 6 in., 8 in., 10 in., and 12 in.
- d) Round, 6 in., 8 in., 10 in., and 12 in.
- e) Square, 8 in., 10 in., and 12 in.

Fire Extinguishers — Pyrene and Acid
First-Aid Cabinet and Supplies
Floor Brushes — 18 in.
Funnels — tin, assorted sizes
Gauges
- a) Air pressure
- b) Center
- c) Depth
- d) Thread
- e) Thickness

Glass Cutters
Goggles
Grease Guns — plain and pressure-type
Hammers
- a) Ball-peen, 4-oz.
- b) Ball-peen, 1¼-lb.
- c) Ball-peen, 2-lb.
- d) Lead
- e) Riveting
- f) Sledge, No. 12

Ladle
- a) 3 in. bowl
- b) 6 in. bowl

Lamps — extension, with reels
Lead Pot — gas
Magnet Charger
Meters — volt and ammeter test
Micrometers
- a) Outside, 0 to 1 in.
- b) Outside, 2 in. to 3 in.
- c) Outside, 3 in. to 4 in.
- d) Inside, 1½ in. to 6 in.

Molds
- a) Battery nut
- b) Battery post
- c) Battery strap
- d) Burning stick
- e) Lead hammer

Oilstone
Pipe Taps — ⅛ in., ¼ in., ⅜ in., and ½ in.
Pliers
- a) Combination, 6 in.
- b) Flat nose
- c) Round nose

Pullers
- a) Bearing
- b) Gear
- c) Wheel, hub type

Punches
- a) Center
- b) Taper pin
- c) Blacksmith

Putty Knives
Reamer — splindle bolt
Reamer Sets
- a) Piston pin, ½ in. to 1⅜ in.
- b) Taper pin
- c) Valve seat

Saws
- a) Hack, frames, 10 in., adjustable
- b) Hack-saw blades, 18, 20, and 24 teeth
- c) Hand

Scales
- a) Steel, 6 in., graduated 1/64 and 1/100 in.
- b) Steel, 12 in., graduated 1/32 in.

Scrapers
- a) Bearing
- b) Carbon

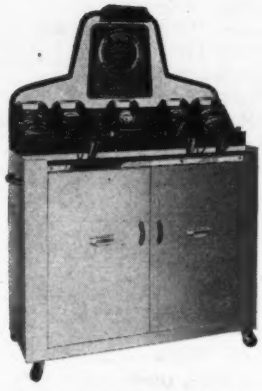
Screw Drivers
- a) 6 in. and 12 in.
- b) Small combination

Screw Extractors
Scribers
Snips — tin, 3 in. straight and 3 in., curved
Soldering Coppers — 1-, 2-, and 3-lb. with handles
Spring Spreaders
Stamps
- a) Figures, 3/16 in.
- b) Letters, 3/16 in.

(Continued on page 58A)

WEIDENHOFF

Essential aids for vocational education in today's automotive repair and maintenance industries.



The Weidenhoff Model 1017 Analyzer makes available to the school shop modern precision instruments that aid to diagnose all varieties of engine troubles on the latest models of automobiles, trucks, and tractors.

Consists of the following individual units:

- Model 1002 Ammeter, Voltmeter with Rheostat
- Model 1004-B Condensor Tester
- Model 1006 Welded Steel Cabinet
- Model 1007 Coil Tester
- Model 1008 Contact Dwell Indicator
- Model 1011 Vacuum Compression and Fuel Pump Tester
- Model 822 Back Panel and Light
- Model 820 Electronic Tachometer

A feature of especial interest is removable unit construction. Enables more than one operator to use the equipment at the same time. Full details pertaining to range of tests possible with the various pieces of equipment making up Model 1017 Engine Analyzer available upon request.

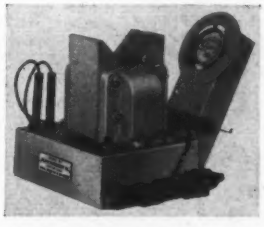
Timing Lights

A variety of substantially made timing lights represented in the models Nos. 892, a Stroboscopic Timer; 890, an inexpensive high quality Timing Light; and 901, a Neon Timing Light, are available. All lamps have one lead 36" long and one lead 42" long, connecting clips insulated with soft rubber insulators.

Model 1057 Distrib-U-Scope

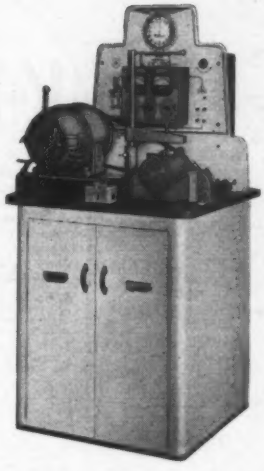
The Weidenhoff Distrib-U-Scope operates on a new and revolutionary principle, and shows directly, accurately, and instantly every condition of the

distributor. No complicated adjustments—no mathematical problems to work out—no guesswork. Adjustments are made and results noted while instrument is running. Wide bands of brilliant color, in red and blue, make distinct, accurate, direct readings possible at a glance. Also available as Model 1059, a bench type without the steel floor cabinet.



Double Wound Growlers 700 Series

The 701 Growler represents a popular unit for the school auto shop. Its effectiveness and trouble-free operation are due to several in-built features determined by many years of industrial experience. Troubles usually difficult to determine in defective armatures are located swiftly and easily. Double windings with two-switch positions, a meter, and test-prods provide means of making a great variety of audible and visual tests. A folder entitled "Uses of the Growler" will be sent free on request.



Model 350 Cyclone Test Bench

Especially designed for the testing of generators as used in passenger cars and light trucks. Varied requirements of generators on modern motor vehicles have necessitated designing units with characteristics adaptable to individual installations. This unit provides a great variety of service in the school auto electricity shop and is especially distinguished by its simplified method of connections and accordingly eliminating complicated "hookups." Available as Model 350 for bench mounting without cabinet. Cabinet is optional. Larger, heavy duty benches available.

Model 802 Exhaust Gas Analyzer

Provides a means of determining carburetor conditions accurately and quickly, either within the school shop, in the test yard, or on the road. Attractive cabinet is furnished with rubber casters and a large compartment for tools and adapters. Lower rear compartment houses a 6-volt storage battery (not furnished) which supplies current to Analyzer. Model 801 is Exhaust Gas Analyzer without the cabinet. A very substantially built, long lived, and accurate instrument.

These units represent only a small part of the variety of units available to the school auto shop from the testing and manufacturing laboratories of Weidenhoff. Complete details sent upon request.

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K-D Tools
Essentials in the equipment of every auto repair shop are good tools . . . correctly designed tools . . . strong, dependable tools. For 20 years K-D has made just such tools . . . to speed up your work and make easy jobs out of the hard ones. Here are a few, picked at random from the catalog. If you don't know the whole line, write today for a free catalog . . . it will pay you!
1. No. 380 Compressor for general shop use. Fast, strong, dependable. 2 pairs of jaws, one straight, one offset, hardened and adjustable. Extra high jaws available. Services nearly all motors. Throat, 10" x 10¾".
2. No. 900 Lifter for under-fender use. Hardened, adjustable jaws with auxiliary set to furnish extra high lift. Only 8½" long.
3. No. 600, an old favorite with thousands. Services most L-head motors. 10" long.
4. Valve Guide Pullers for Ford motors. Pull valve assemblies, no matter how tight they are stuck. Strong, drop-forged construction. Fast and fool-proof. Packed in sets, including Driver (not shown) for removing guide retainer. 920 set, Ford 85, Mercury and Lincoln-Zephyr. 860 set, Ford 60.
5. Valve Grinding Bushings—all Ford motors. Also used when establishing stem clearance. Accurately machined, one-piece, hinged construction. 511, Ford A & B. 1118, Ford 85, Mercury and Lincoln-Zephyr. 1160, Ford 60.
6. Vacuum Valve Grinders. Cup held on center of valve head by steel retaining ring and spring. Cup diameter No. 503, 1½", No. 868, 1⅛".
7. No. 875 Piston Ringer. Removes and installs all makes and types of rings up to 4" dia. Eliminates stretched rings and cut fingers.
8. No. 870 Piston Ring Filer. A double-faced rotary filer, does a square and parallel job. Handles all makes, types and sizes.
9. Pliers Sets. Handy little 4½" Pliers, well made and correctly tempered, packed in a variety of Sets. 4 shapes—Standard, Parrot, Plain and Points. No. 511 Set (shown) includes Standard, Points and a 3-in-1 screwdriver in leatherette case. Write for complete information on all sets.
10. K-D Washers, made in any size, any material. "Brite-Steel" Washers made in SAE, USS and Rivet sizes, regular and Veri-thin, from ⅛" to 1". 1 lb., 5 lb., bulk. Also several convenient shop packages.
ASK YOUR JOBBER FOR NET PRICES
K-D Manufacturing Co.,
LANCASTER, PA.

(Continued from page 56A)

Tap-and-Die Sets
- *a*) Machine screw
- *b*) S.A.E. ¼ in. to 1 in.
- *c*) U.S.S. ¼ in. to 1 in.

Tire Tools
Tool Kit — metal box or canvas roll, empty
Twist Drills — (extra sets) selected sizes
Valve
- *a*) Grinders (hand)
- *b*) Spring lifters

Wrenches
- *a*) 8 in., 10 in., 12 in., and 18 in.
- *b*) Ignition sets
- *c*) Pipe, 10 in., 14 in., 16 in., and 18 in.
- *d*) Rim socket
- *e*) Socket sets, large assortment with case
- *f*) Spark plug
- *g*) Speed wrenches
- *h*) Standard end sets, ¼ in. to ⅞ in., U.S.S. and S.A.E.
- *f*) Valve-tappet wrenches

Automotive Shop—Materials and Supplies

Acetylene Gas — in drums, for welding
Acid
Alcohol
Babbitt
Bearing Blue
Bearing Compound
Bolts
- *a*) Machine, selected sizes
- *b*) S.A.E., selected sizes
- *c*) Stove, flat or round heads, selected sizes

Brake Juice — ½-pt. cans
Brushes
- *a*) Paint
- *b*) Spark-plug
- *c*) Spoke
- *d*) Steel
- *e*) Varnish

Chamois
Coil-Spring Assortment
Copper Tubing
Cotter Pins — assorted sizes
Crocus Cloth
Distilled Water
Drain Cocks
Electrolyte
Emery Cloth — Nos. 00, 0, ½, and 1
Enamel — Auto Painting
Gaskets
- *a*) Copper asbestos
- *b*) Cork and felt
- *c*) Flange

Gasoline
Grease — cup, cans
Kerosene
Keys, Whitney — assorted
Lacquer — colors
Lead
Lubricant — transmission
Nails and Brads
Nuts
- *a*) S.A.E., castellated, square, hexagon, selected sizes and kinds
- *b*) U.S.S., square and hexagon, selected sizes
- *c*) Machine-screw, selected sizes
- *d*) Wing, selected sizes

Oil
- *a*) Cylinder, light, medium, and heavy
- *b*) 600W
- *c*) Penetrating

Oxygen — in drums for lead burning
Pig Lead
Piston-Ring Compressors
Radiator Hose
Rivets — brake-lining, 5/16 in., ½ in., and ¼ in. long
Sandpaper — Nos. 00, 0, ½ and 1
Screws
- *a*) Flat-head or round-head, iron or brass, selected sizes and kinds
- *b*) Cap and machine, iron or brass, selected sizes and kinds

Sealing Compound
Shellac — ½-pt. cans
Shim Stock
Soapstone
Solder — bar, wire, or self-fluxing wire
Soldering Paste
Spelter — for brazing
Sponges — ½-lb.
Starting Cable
Tacks and Staples — upholstery
Tire
- *a*) Carcass fabric
- *b*) Cushion stock
- *c*) Inner-tube repair stock
- *d*) Patching cement
- *e*) Patches
- *f*) Putty
- *g*) Tread stock
- *h*) Vulcanizing

Valve-Grinding Compound — coarse and fine
Washers
- *a*) Lock, assorted sizes
- *b*) Wrought-iron

Waste
Wire — primary and secondary

TRAINING FOR NATIONAL DEFENSE

With these Bruce Shop Books as your foundation, your classes can be made most timely by building your courses around the idea of training for national defense.

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MACHINE WOODWORKING
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ELEMENTARY PRINCIPLES OF DIESEL-ENGINE CONSTRUCTION
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Members of Teaching Staff, Mechanics' Institute, Boys' Technical High School, Milwaukee, Wis.
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BLUE-PRINT READING
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48 cents

NOTES FOR MECHANICAL DRAWING
By
Mathewson and Stewart
$1.80

THE BRUCE PUBLISHING COMPANY
703 Montgomery Building ◆ Milwaukee, Wisconsin

Printshop Equipment and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

Bellows
- *a)* Hand, small size
- *b)* Electric, blower type

Blackboard — permanent or portable

Bookcase — for reference books, catalogs, etc., sectional preferable

Brayer — 6 in. or 8 in., for proofing

Brushes
- *a)* Bench
- *b)* Benzine, No. 1, oval black
- *c)* Floor
- *d)* Padding, 1½ in. wide

Bulletin Board

Cabinets
- *a)* Galley, for double-column, wood or steel, four tiers (to be used with typesetting machines)
- *b)* Galley, for 8¾ in. by 13 in. galleys, wood or steel, four tiers
- *c)* Ink and roller, to accommodate platen-press rollers, wood or steel
- *d)* Matrix, for use with typesetting machines only
- *e)* Roller, cabinet or rack for cylinder rollers
- *f)* Supply, for leads, slugs, spaces, strip material, with top for lead cutter and mitering machine
- *g)* Type, school-type, each to accommodate two California cases, job cases, case slides, galley slide, and copy holder
- *h)* Type, complete with 24 full-size California job cases, with overhead lead-and-slug cases, wood
- *i)* Type, complete with 24 full-size California job cases, double work bank, wood or steel
- *k)* Wood or metal, for filing class records, instruction sheets, etc.

Cans
- *a)* Benzine, pint-size
- *b)* Benzine, 5-gal. size
- *c)* Kerosene, safety, 1-gal. size
- *d)* Waste can, fireproof, for rags

Cases
- *a)* Blank, full-size, to accommodate ¼-size cases
- *b)* Border, ¼-size, for ornamental borders
- *c)* Lead and slug, regular-size, to hold labor-saving fonts of leads and slugs
- *d)* Metal furniture, to hold labor-saving fonts
- *e)* Rule, ¼-size, for brass rule

Chairs — teacher's and tablet-arm

Chase Racks
- *a)* For platen presses
- *b)* For cylinder presses

Chases
- *a)* For each size of platen press
- *b)* For cylinder press

Composing Sticks — 6 in. x 2 in., 8 in. x 2 in., 12 in. x 2 in., and 18 x 2 in., adjustable

Cutter
- *a)* Lead and rule
- *b)* Paper, lever-type, 20 in., with pedestal. Should handle 20 in. x 26 in. sheet
- *c)* Paper, lever-type, 26 in. or 30 in.
- *d)* Paper, lever-type, 30 in., with divided back gauge
- *e)* 30 in. to 36 in. power cutter

Desk — teacher's, with drawer compartments

Drying Racks
- *a)* Combination drying rack and stock table for platen presses, 30 trays
- *b)* Trays, interlocking, for cylinder press

Folding Bones — for hand folding

Folding Machine — 20 in. x 26 in. size, 4-fold, two parallel and two right-angle folds, power

Furniture — iron, 2 x 4 to 10 x 15 picas

Galleys — Steel, 8¾ in. x 13 in., 6¼ in. x 23½ in., double column, and 12 in. x 18 in.

Gauge Pins — spring-tongue

Glue Pot — electric, 1-qt. size

Imposing Tables
- *a)* 12 in. x 18 in., with iron top, including reglets and furniture
- *b)* 24 in. x 36 in., with iron top, complete with galley slides, chase rack, reglets, and furniture
- *c)* 36 in. x 48 in., with iron top, complete with galley slides, chase rack, reglets, and furniture
- *d)* 39 in. x 63 in., with iron top, complete drawers, letter boards, reglets, and furniture

Ink Fountains
- *a)* Short, for 8 x 12, 10 x 15, and 12 x 18 presses
- *b)* Long, for 10 x 15, and 12 x 18 presses

Knives
- *a)* Overlay, for make-ready
- *b)* Ink, 6 in. and 8 in.
- *c)* Ink, 8 in., square end

Leader Boxes

Leaders
- *a)* 6-pt., 8-pt., and 10-pt., fine dot
- *b)* 8-pt. and 10-pt. hyphen

Line Gauges
- *a)* Metal, brass, or steel
- *b)* Wood

Metal Furnace — for recasting and refining type metal, used only with typesetting machines

Mitering Machine

Numbering Machines
- *a)* For use on presses
- *b)* Hand machines

Ornaments
- *a)* Assorted floral and decorative designs
- *b)* Border, 6-pt. and 12-pt., decorative

Perforator
- *a)* 24 in., foot treadle
- *b)* 28 in., foot treadle

Planer
- *a)* Mallets, hickory or fiber
- *b)* Proof, maple, with felt bottom
- *c)* Type, maple, with leather top

Presses
- *a)* Cylinder, two-revolution, four-roller, 25 x 38, complete with variable-speed motor, cast rollers, etc.
- *b)* Platen, 8 x 12, with foot treadle, counter, flywheel guard, platen guard, brake, and set of cast rollers (motor and treadle combination if desired)
- *c)* Platen, 10 x 15, complete with variable-speed motor, counter, flywheel guard, brake, and set of cast rollers, etc.
- *d)* Platen, 12 x 18, complete with variable-speed motors, counter, flywheel guard, platen guard, brake, and set of cast rollers, etc.
- *e)* Proof, 14 x 18, with cabinet
- *f)* Proof, 20 x 24, with cabinet

Punch
- *a)* Foot-power, multiple, with assorted punches
- *b)* Lever, two-die, with assorted punches
- *c)* Power, multiple, with assorted punches (paper drill may be substituted)

Quoins
- *a)* Sizes No. 1 and No. 2
- *b)* Keys, Sizes No. 1 and No. 2

Rule — plain and brass (fonts to fit quarter cases)
- *a)* 2-pt., labor-saving, hair-line, side face
- *b)* 2-pt., labor-saving, 1-pt. side face
- *c)* 1-pt., labor-saving, 1-pt. face
- *d)* 2-pt., labor-saving, double face

Saw Trimmers — pedestal type, with point gauge, and raising and lowering table

Spacing Material
- *a)* Iron furniture, as selected
- *b)* Leads, labor-saving, 2-pt.
- *c)* Leads, 2-ft. strips, 2-pt.
- *d)* Slugs, labor-saving, 6-pt.
- *e)* Slugs, 2-ft. strips, 6-pt.
- *f)* Spaces and quads
- *g)* Thin spaces, brass and copper, assorted sizes, 6 to 8 pt., one size in each box

Specimen Display Board

Staple Binder — pedestal-type, foot power

Stitcher — wire, power, capacity ½ in. or ¼ in., flat and saddle-back tables

Tweezers — 3½ in.

Tympan Paper (with combination holder and cutter)
- *a)* 18 in.
- *b)* 38 in., upright, to be used with cylinder press only

Type
- *a)* Body, lightface — 8 and 10 pt.
- *b)* Job lightface — 6, 8, 10, 12, 14, 18, 24, 30, 36, and 48 pt.
- *c)* Job, lightface italics — 8, 10, 12, 14, 18, 24, and 36 pt.
- *d)* Job, boldface — 6 and 8 pt.; 12 pt.; No. 26; 12-pt. No. 27; 12-pt., No. 28; 18-pt., No. 30
- *e)* Job, light copperplate Gothic — 6 pt. Nos. 1, 2, 3, 4; 12 pt., Nos. 5, 6, 7, 8
- *f)* Job, condensed title Gothic — 12, 18, 24, 36, 48, 60, and 72 pt.
- *g)* Job, text type — 10, 12, 14, 18, and 24 pt.
- *h)* Job, typewriter type — 12 pt. with spaces
- *j)* Job, boldface italic — 8, 10, 12, 14, 18, 24, 30 and 36 pt.
- *k)* Job, heavy copperplate Gothic — 6 pt., Nos. 21, 22, 23, and 24; 12 pt., No. 25
- *l)* Wood, condensed Gothic — 8, 12, 15 and 18 line

Typesetting Machines
- *a)* Either linotype or intertype, 2 or 3 magazines, and molds
- *b)* Matrices for same, 6-, 8-, 10-, and 12-point, as selected

Supplies

Benzine or Gasoline — for cleaning type or presses

Bindery Tape — 2 in. wide, brown or black

Gold Bronze — pale

Ink
- *a)* Bond, black, for bond papers
- *b)* Book, black, for school paper, etc.
- *c)* Cover, colors as selected
- *d)* Dryers and compounds, as selected
- *e)* Halftone, black
- *f)* Job, colors as selected

(Continued on page 66A)

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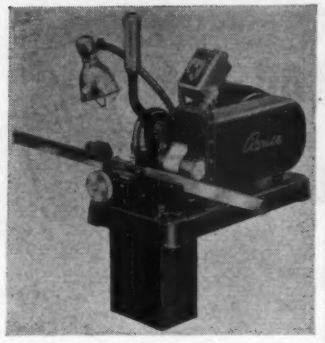

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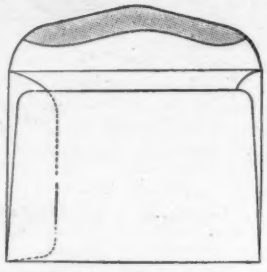
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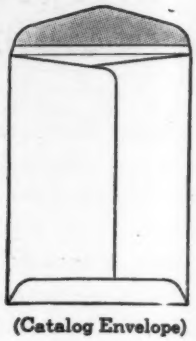
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(Continued from page 60A)

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Kerosene — for cleaning rollers

Padding Cement
a) Cold
b) Hot

Paper
a) Bond, fine grade, 17 x 22 — 20, white
b) Bond, medium grade, 17 x 22 — 20, white
c) Bond, sulphite, 17 x 22 — 20, white
d) Bond, sulphite, 17 x 22 — 20, colors as selected
e) Book, enamel, 25 x 38 — 80, white
f) Book, machine finish, 25 x 38 — 80, white
g) Book, eggshell finish, 25 x 38 — 60, white
h) Cover, as selected, 20 x 26, medium
j) Card Bristol, fine grade, 22 x 28 — 4-ply, white
k) Index Bristol, medium grade, 25½ x 30½ — 110, white
l) Index Bristol, medium grade, 25½ x 30½ — 140, white
m) Mill Bristol, medium grade, 25½ x 30½ — 140, colors as selected
n) Pressboard, red
o) Strawboard, No. 40 or No. 50
p) Tagboard, manila, 24 x 36 — 140
q) Tympan, to fit presses
r) Wrapping paper, size as selected
s) Holder for same

Paste
a) Bindery
b) Make-ready

Twine — cotton, for tying jobs

Wire Stitching
a) No. 25 round wire for stitcher
b) Wire staples, ¼ in.

(Continued from page 52A)

Tau Chapter initiated the following men: Arthur F. Ahr, Beacon, N. Y.; Michael F. Blawat, Silver Creek, N. Y.; Frank C. Campbell, Lindenhurst, N. Y.; Carl J. Heintz, Lockport, N. Y.; Herbert F. Lidstrom, Mamaroneck, N. Y.; Francis B. Schoonover, Lockport, N. Y.; Harry Spurr, Cornwall-on-Hudson, N. Y.; John P. Walsh, Vestal, N. Y.; Bernard C. Swift, Pearl River, N. Y.; Carl W. Zeh, Dansville, N. Y.

Phi Chapter: Clayton W. Blakeslee, Hastings-on-Hudson, N. Y.; William D. Chatfield, Kings Park, N. Y.; Edward C. Fellows, Richmondville, N. Y.; William F. Hinman, Syracuse, N. Y.; William M. Jenack, Hillsdale, N. Y.; Harold W. Jonas, Frankfort, N. Y.; Courtney Newstead, Mexico, N. Y.; Emerson E. Newthardt, Delmar, N. Y.; Kenneth L. Parker, Hancock, N. Y.; William O. Robinson, Fulton, N. Y.; Frederick W. Roden, E. Greenbush, N. Y.; Albert Saunders, Fayetteville, N. Y.; Joseph A. Schad, Newport News, Va.; Albert C. Truman, E. Rochester, N. Y.; Glenn A. Wagner, Burnt Hills, N. Y.; Roland F. Wolford, Lamson, N. Y.

The ritual team was composed of the following Buffalo State Alumni: Ellsworth F. Baldwin, Brighton, N. Y.; Aurie F. McCabe, Carthage, N. Y.; L. John Cox, Brocton, N. Y.; Duane Harris, Canisteo, N. Y.; Carl F. Pfeiffer, Mayville, N. Y.; Richard C. Burau, Beaver Falls, N. Y.; Frederick Neuschel, N. Tonwanda, N. Y.

The National Secretary is Dr. William E. Warner, Ohio State University, Columbus, Ohio, and the faculty sponsors are George C. Decker, co-sponsor, State Teachers College, Buffalo, N. Y., and Gordon O. Wilber, State Normal School, Oswego, N. Y.

A banquet followed in honor of the initiates in the Walnut Grill of the Hotel Syracuse, with a total of 80 men. Banquet guests were: Dr. Julian E. Butterworth, director of the Graduate School of Education, Cornell University, Ithaca, N. Y.; Roy G. Fales, supervisor of industrial-arts education, The State Education Department, Albany, N. Y.; Prof. John J. Hatch, sponsor of the Omicron Chapter, State Teachers College, Newark, N. J.; Dr. Ralph Horn, dean, The State Teachers College, Buffalo, N. Y.; Dr. Frederick Moffitt, publicity director of the New York State Teachers Association, Albany, N. Y.; Dr. Joseph C. Park, formerly director of industrial arts, State Normal School, Oswego, N. Y.; George E. Schultz, chairman, industrial-arts section of the New York State Vocational Association, Buffalo, N. Y.; Dr. William E. Warner, professor of education, Ohio State University, Columbus, Ohio, National Secretary of Epsilon Pi Tau; and Dr. Lewis A. Wilson, associate commissioner and acting commissioner for vocational and extension education, The State Education Department, Albany, N. Y.

These guests were presented by William E. Huss, instructor, Oswego State Normal School.

The speaker of the evening was Dr. Lawrence F. Ashley, Chief of the Division of Vocational Education, Yonkers, N. Y., whose topic was, "Thinking Our Way Through."

♦ The January meeting of the Westchester Industrial Arts Club was held on Friday evening, January 17, in the new school at Hartsdale, N. Y. Warren Casterlin, the host of the evening, held open house in his spacious, well-planned and well-equipped shop.

After visiting the shop the members convened in the auditorium to listen to two reports. One, which had to do with the possibility of a vocational school for Westchester County, was given by Earl V. Core, supervising engineer for the Lehigh Valley Railroad and member of the Greenburgh No. 7 board of education. The club voted to stand ready to offer any assistance that it could for the consummation of this project if and when it became a probability.

The second report was given by Herbert F. Lidstrom of Rye Neck, the club's delegate to the industrial-arts steering committee of the New

(Continued on page 68A)

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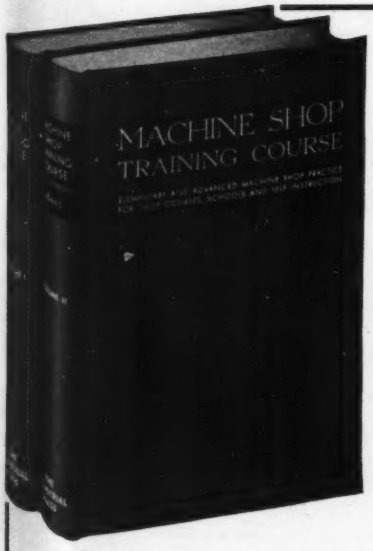

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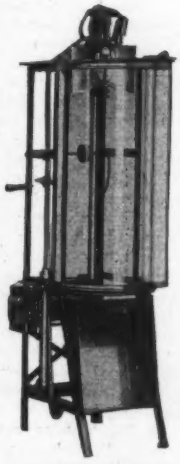

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SNIPS

(Continued from page 66A)

York State Vocational and Practical Arts Association Conference which was held in Syracuse, N. Y., on December 26 and 27.

The usual routine business of the club was transacted at which Charles Lefferts of Longfellow School, Yonkers, N. Y., president of the club, presided. — *Herbert F. Lidstrom.*

♦ The department of industrial and vocational education of Kansas State Teachers College, Pittsburg, Kans., held its sixth annual dinner in the Arabian Room, Hotel Besse, Pittsburg, on Saturday evening, January 18, 1941, at six o'clock. The purpose of the annual dinner is to receive reports from members of the staff who attend the two important national industrial-education meetings of the year.

This year two men attended the thirty-first annual meeting of the Manual Arts Conference of the Mississippi Valley at the University of Missouri, November 14–16, and three men attended the thirty-fourth annual convention of the American Vocational Association, in San Francisco, December 16–18.

In addition to members of the department faculty and their wives, graduate students, and members of the senior class, other guests at the dinner included Dr. O. P. Delinger, acting president; Mrs. Dellinger; Dr. C. B. Pyle, acting dean of the College and of the Graduate Division; Mrs. Pyle; Dean and Mrs. G. W. Trout.

Guests from out of the city were Mr. and Mrs. James C. Woodin, director industrial education, Wichita, Kans.; Mr. and Mrs. Verne L. Pickens, supervisor industrial arts, Kansas City, Mo.; Leon E. Falgren, director industrial education, Kansas City, Kans.; Mr. and Mrs. A. W. Blake, director industrial education, Fort Smith, Ark.

The program consisted of Walter L. Friley, who discussed the Manual Arts Conference; Dr. Otto A. Hankammer discussed the American Vocational Association; and Rudolph L. Schwanzle spoke on "The Significance of the NYA Program to the Industrial Arts Teacher." Dr. William T. Bawden, head of the department of industrial and vocational education at Kansas State Teachers College, served as toastmaster and supplemented the reports of the other speakers.

♦ The first annual printing banquet sponsored by the Graphic Arts Club of Kansas State Teachers College, Pittsburg, Kans., was held on January 13.

John J. Backus, manager of the department of education of the American Type Founders Sales Corp., Elizabeth, N. J., the principal speaker, addressed a capacity crowd of students, editors, and printers.

Laurence G. Cutler, club sponsor, served as chairman of the meeting and Dr. C. B. Pyle, acting Dean of the College, served as toastmaster.

Following the address of Mr. Backus, Dr. W. T. Bawden, head of the industrial and vocational education department made brief remarks in behalf of the college and the department, and Prof. Leroy Brewington, supervisor of printing, introduced the visiting editors, printers, teachers, and superintendent who were in attendance.

Mr. Backus discussed the close relationship between educators and printers, saying, "One cannot carry on without the other. The importance of freedom of the press is the entire basis for the structural and economic system of the United States, and without it the entire system would collapse."

♦ The regular monthly meeting of the New York School Crafts Club was held in the Imperial Hotel, New York City, January 18, 1941.

The speaker of the evening was Mr. Quinn from the Casein Company of America who presented a most interesting talk and demonstration on casein glue. He made a comparison of the different kinds and grades of Casco Glue, their properties, advantages and disadvantages as applied to different kinds of work. The lecture and demonstration was appreciated and ample evidence of interest was evinced by the numerous questions asked of the speaker.

The next meeting will be held in the Imperial Hotel on February 15, 1941. The feature of the program will be "End of the Term Jobs Which Can Be Completed in Two to Four Periods" by Charles G. Fischer, Teacher, Junior High School 210, Brooklyn. — *Allan S. MacGregor.*

♦ The Western Arts Association will meet on March 20, 21, and 22, at the Stevens Hotel, Chicago, Ill.

The program for the industrial-arts section will begin on Thursday at which Louis V. Newkirk, director, bureau of industrial arts, Chicago schools, will preside, and Harold C. Achtenhage, industrial-arts department, Chicago schools, will act as secretary. The first address on Thursday will be delivered by Gilbert Rohde on "Design Training." This will be followed by Dean M. Schweickhard, assistant superintendent of schools, Minneapolis, Minn., who will speak on "Animated Industrial Arts." The discussion leader for Thursday will be Frank C. Moore, director of industrial arts, Cleveland, Ohio.

At the Thursday noon luncheon Dr. William H. Johnson, superintendent of the Chicago public schools, will speak on "Modern Trends in Industrial Arts Education."

At the Friday session, Mr. Wallman of Des Moines, Iowa, will preside. with Coleman Hewit, of the Chicago Teachers College acting as secretary. On this day the first speaker will be Renzo Rutili who will discuss "Twentieth Century Trends in Furniture and Furnishings." This will be followed by a panel discussion with the following participants: Hazel Stillman, principal, Tuley High School; Dr. Pierce, principal, Wells High School; Daniel F. O'Hearn, principal, Steinmetz High School; David M. Davidson, principal of Senn High School; Henry H. Hagen, High School District Superintendent; and Louis V. Newkirk, all of Chicago schools. The discussion leader will be Arthur B. Mays, professor at the University of Illinois.

♦ Plans have just been approved whereby there will be but one industrial-arts conference in Pennsylvania each year. In former years California, Pa., has held an annual Western Pennsylvania Industrial Arts Conference and Millersville has held an annual Eastern Pennsylvania Industrial Arts Conference. This combined organization, the All-State Industrial Arts Conference will be held this year on the Millersville campus on April 26. The conference will alternate each year between the two towns.

♦ The Annual Convention of the Michigan Industrial Education Society will be held in Grand Rapids, March 6–8, 1941. It will be noted that these dates are approximately two months earlier than usual.

♦ The National Council of Teachers of Mathematics will have its twenty-first annual meeting in Atlantic City on February 21 and 22, 1941.

The theme of the meeting will be "Mathematics in a Defense Program." All phases of this theme will be discussed in connection with the various sessions: general meetings, elementary schools, secondary schools, teacher education, and visual aids.

Questions or suggestions concerning this meeting should be addressed to 525 West 120 St., New York City. — *Kenneth Brown.*

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The author's experiences as an instructor and

(Continued on page 74A)

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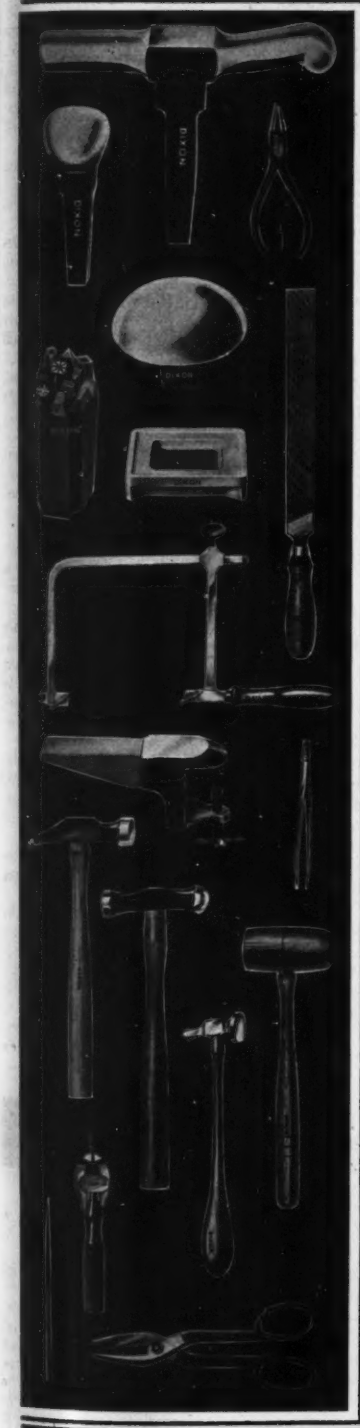

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Benches — plain or with drawers, for tools and equipment, or with compartments for the storing of wiring panels. Preferably they should have electrical outlets
Bits
a) Auger, ¼ in. to 1 in. by 16ths
b) Auger, 11/16 in., 18 in. long
c) Drill, for wood, square shank, ⅛ in. to ½ in., by 16ths
d) Expansion
e) Extension, 18 in.
f) Screw-driver, ¼ in.
Blackboard — permanent or portable
Blowtorches — 1 qt. size
Bookcase
Braces — ratchet-type, 8 in. swing
Bulletin Board
Cabinets — wood or metal, for filing class records, instruction sheets, drawings, etc.
Chairs — teacher's and tablet-arm
Compass Saw
Coil
a) Spreader
b) Taper
c) Winder
Desk — teacher's, with drawer compartments
Drill
a) Breast
b) Concrete, ⅜ in., ½ in., ¾ in., 1 in.
c) Hand
d) Portable, electric
e) Twist, 1/32 in. to ⅜ in. by 32nds
Drill Press
a) Bench, hand or power driven
b) Heavy, power driven
Files
First-Aid Cabinet and Supplies
Hack Saw
a) Blades, 10 in., 24-tooth
b) Frames, adjustable
Hammers
a) Claw, 12-oz.
b) Machinists', ball-peen
Hickey — ½ in. and ¾ in.
Lathe
a) Engine, 10 in. or 12 in. swing, 6 ft. or 8 ft. long
b) Speed
Pliers
a) Gas, 6½ in. and 8 in.
b) Side-cutting, 6 in.
Punch — for metal molding
Punches — assorted
Reamers
a) Pipe burring, ¼ in. to 1 in.
b) Pipe burring, ½ in. to 2 in.
Rules
a) 48 in. zigzag
b) 72 in. zigzag
Screw Drivers — 3 in., 5 in., and 8 in.
Shears — for cutting metal molding
Solder Dippers
Soldering Coppers
a) Assorted
b) Electric
c) Handles
Stocks and Dies — for pipe threads, ½ in. to 1 in.
Vises
a) Machinists', 4 in.
b) Pipe
Wrenches
a) Adjustable, 6 in. and 8 in.
b) Pipe, 10 in., 12 in., and 14 in.
c) Socket, combination

Electrical Shop—Supplies

Abrasive Cloth — Aluminum oxide. 1, 1½, and 2 in. wide
Armored Cable
a) 2-wire, No. 14, single-strip
b) 3-wire, No. 14, single-strip
c) Box connectors
Attachment Plug
Bar Hangers
Batteries — dry cells
Battery Acid — 1.300
Battery Sealing Compound
Box Cleats
Brads — ¾ in., No. 19, and 1½ in., No. 16
Brake Lining — ¼ in. x 2 in.
Brushes — carbon, for motors and generators
Burglar Contacts
a) Open-circuit
b) Closed-circuit
Bushings
a) Loom, No. 1 and No. 2
b) "Jiffy" loom No. 2
Buzzers
Cleats — unglazed porcelain, 2-wire
Clips — test, with insulators, Universal, Nos. 22, 23, 24 and 25
Commutator Cement
Conduit
a) Bushings, ½ in., ¾ in., and 1 in.
b) Box connectors, for flexible
c) Couplings, for flexible
d) Lock nuts, ½ in., ¾ in., and 1 in.
e) Rigid, ½ in., ¾ in., and 1 in.
Condulet
a) Fillings, ½ in., LL, LR, and LB
b) Covers, ½ in., blank
Door Openers — mortised
Fish Paper — .0125 in. thick
Fixtures — brass-chain, suspension
Fixture Studs
Fuses
a) Plug-type, renewable, 125-volt, 15 amp.
b) Cartridge-type, renewable, 125-volt, 30 amp.
c) Renewals for plug fuses
d) Renewals for cartridge fuses
Ground Clamps — ⅜ in. to 1 in., assorted
Hickey Grips — ½ in. and ¾ in.
Lamps
a) Carbon, 220-volt, 60-watt
b) Mazda, selected as wattages and voltages
c) Guards for brass sockets
Leather Nail Heads
Lugs — 25- and 50-amp.
Lumber — 2 in. x 4 in. x 14 ft., No. 1, white pine dressed 4 sides
Molding
a) Metal
b) Metal, fittings — crosses, tees, internal elbows, junction boxes, switch bases, keyless receptacles, snap switches
c) Wood, 2-wire, with capping
d) Wood, 3-wire, with capping
Nails — roofing
Nuts — iron, 4-36, 6-32, 8-32, 10-24, 12-24, 10-32, 14-20
Outlet Boxes — 4 in. square, with one round blank cover, and one cover with bushed opening
Pipe Straps — galvanized, ⅜ in., ½ in., ¾ in., and 1 in.
Push Buttons
a) Return-call, 3-point
b) Single
Receptacles
a) Flush, duplex
b) Porcelain-cleat, 660-watt, 250-volt
c) Concealed
d) Covers
Rectifiers — Tungar, for charging from 1 to 12, 6- and 12-volt batteries
Relays — Dixie
Resistance Boards — for testing
Resistance Units — 125-ohm
Rheostats
a) Compression, 275-watt
b) Field, for shunt and compound motors
Rosettes — wood
Rotary Converter — 5-kw. capacity, 3-phase a.c., 110-volt d.c.
Screws
a) Anchors, 8/32, 10/24, 12/24, 14/20
b) Machine, round-head, 4-36 x ¼ in., 6-32 x ½ in., 6-32 x ¾ in., 8-32 x ⅜ in., 8-32 x ½ in., 8-32 x 1 in., 10-32 x ⅜ in., 10-24 x ⅜ in., 10-24 x ¾ in., 10-32 x ¾ in., 12-24 x 1 in.
c) Machine, brass, round-head, 4-36 x ¼ in., 6-32 x ½ in., 6-32 x ¾ in., 8-32 x ½ in.
d) Wood, flat-head bright, No. 5 x ¾ in., No. 8 x ½ in., No. 8 x ¾ in., No. 8 x 1 in., No. 7 x 1½, No. 8 x 1½ in., No. 7 x 2
e) Wood, round-head blued, No. 7 x 1 in., No. 8 x 1½ in., No. 10 x 1½ in., No. 7 x 2
Sleeving — No. 1, white; No. 1, blue; and No. 1, red
Sockets
a) Brushed brass-pull-chain, keyless, key
b) Porcelain, keyless, with caps
c) Porcelain, key, with caps
Socket Caps — ¼ in. and ⅜ in. bushed
Solder Wire — 50/50, size No. 10
Soldering Paste — 2-oz. cans, noncorrosive
Soldering Salts — 1 oz. cans, noncorrosive
Speed Counters — 0-9999
Split Knobs — porcelain
Spring Balances — 0-30 lb.
Starting Boxes
a) For compound motors, various makes
b) For shunt-wound, 1 h.p., 110-volt motors. Overload release
c) For shunt-wound, 1 h.p., 110-volt motors. No voltage release
d) Starting devices of various makes and principles, for 1 h.p., 3-phase, 220-volt a.c. motors
Storage Batteries — 6-volt

(Continued on page 72A)

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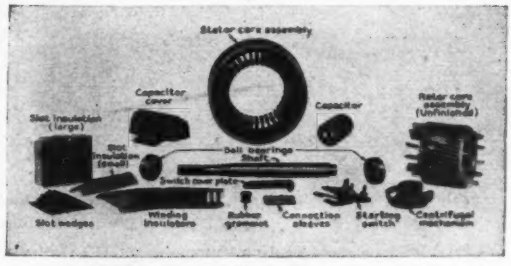
New Shop Projects

The General Electric Company, in carrying out its educational program, has sponsored the preparation and publication of several construction projects for technical and vocational schools. These projects are exceptionally valuable for the school shop due to

Castings for ¼ H.P. Motor.



Motor Kit Exclusive of Castings.

the fact that they are not merely assembly projects but involve a certain amount of mechanical dexterity with such tools as the lathe, drill press, tap and die, etc. The projects will comprise the following standard ratings:

1) ¼ H.P. Single-Phase, 60 cycle, 110 volt capacitor start motor
2) ½ H.P. Single-Phase, 60 cycle, 110/220 volt capacitor start motor
3) ½ H.P. 3-Phase, 60 cycle, 110 volt motor
4) 250 watt compound-wound D-C generator
5) 1½ kw. 220-110/55 volt, single-phase, air-cooled transformer

Kits for these projects can be purchased from the General Electric Company. In addition, complete instructions are given for the securing of any equipment that may not be included in the kit.

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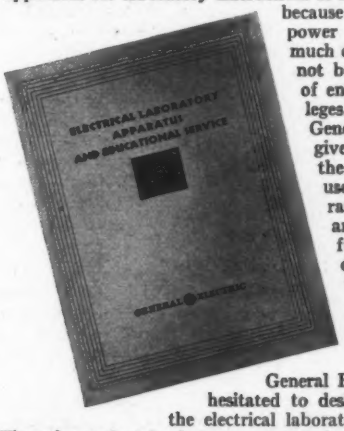
In general the General Electric Company recommends standard apparatus for laboratory instruction. It is recognized, however, that because of its size, cost, and the power required for operation, much commercial apparatus cannot be used in the laboratories of engineering schools and colleges. For this reason, the General Electric Company has given especial attention to the selection for educational use of such standard apparatus as is of suitable size and which will illustrate fundamental principles of design and construction as well as acceptable commercial practice.



Where standard apparatus is not suitable, the General Electric Company has not hesitated to design special apparatus for the electrical laboratory and shop.

Thus the student is given an opportunity, while becoming familiar with the underlying principles of electrical engineering, to become acquainted with actual construction details. Bulletin GEA-1185C which has been recently revised, illustrates and describes G-E apparatus particularly adapted for laboratory use.

Electrical Laboratory and Shop Equipment

When deciding on the equipment for an electrical shop or laboratory, Bulletin GEB-62B will be particularly useful. In this booklet will be found listed in three different groups, equipment to meet a wide range of requirements. For the elementary courses a few of the more important types of machines are recommended, together with control apparatus, measuring instruments, and certain machine tools which should be in every electrical shop. For more advanced work, or as funds become available, equipment from other groups may be added to provide well balanced laboratory equipment which will permit a wide range of experiments.

In addition to listing the equipment, this booklet discusses briefly the several items, explaining why they have been selected and the use to which they may be put in the laboratory.

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(Continued from page 70A)

Switch
- *a*) Battery, 4-point
- *b*) Bases, porcelain, for 10-amp. switches
- *c*) Boxes, 2¾ in. deep
- *d*) Entrance, safety, 2-pole, 30-amp., with 2-branch lighting circuits
- *e*) Entrance, safety, 3-pole, 30-amp., 250-volt
- *f*) Flush, push-button, S.P., D.P., 3-way, 4-way
- *g*) Surface, S1, S3, and S4
- *h*) Knife, type A, D.P.S.T., D.P.D.T., S.P.S.T., and S.P.D.T.
- *j*) Surface, snap, electrolier
- *k*) Surface, snap, S.P.D.P., 3-way, 4-way

Switchboard — as required

Tacks — double-pointed No. 10

Tape
- *a*) Friction, ½-lb. rolls
- *b*) Rubber, ½-lb. rolls

Telegraph Sets — including sounders, keys, and relays

Telephones
- *a*) Complete bridging, independent phones
- *b*) Couch vestibule telephones
- *c*) Receivers, transmitters, induction coils, condensers, and bridging switch hooks

Transformers
- *a*) Bell-ringing, 6-, 8-, 14-volt
- *b*) Single-phase, 110–220-volt, S.K.V.A.

Tubes — porcelain, 5/16 in. x 3 in., 5/16 in. x 5 in., and 5/16 in. x 10 in.

Tubing — flexible nonmetallic, ¼ in. and ⅜ in.

Washers
- *a*) Iron, ¼ in. and ⅜ in.
- *b*) Brass, ¼ in. and ⅜ in.

Wire
- *a*) Annunciator No. 18 or No. 20
- *b*) Fixture, No. 18, single yellow, with marker
- *c*) Rubber covered, solid copper, No. 10, black
- *d*) No. 10, white
- *e*) No. 14, black
- *f*) No. 14, white
- *g*) Rubber covered, No. 16, brewery cord
- *h*) No. 18, lamp cord, green and yellow
- *j*) S.C.C. copper magnet, enameled, sizes Nos. 16 to 26 inclusive

Electrical Shop—Motor and Testing Equipment

Annunciators
- *a*) Automatic needle-drop
- *b*) Gravity-drop
- *c*) Manual needle-drop

Armatures — burnt-out, for repairing

Battery Charger — commercial

Circuit Breakers
- *a*) Air, single-pole, overload, 25-amp., 550-volt
- *b*) Air, single-pole, underload, 15-amp., 550-volt

Controllers
- *a*) For multiple-speed motor
- *b*) For 1-h.p., 110-volt series motors

Generators
- *a*) Motor-generator set, 10-h.p., to supply 110-volt d.c. for testing purposes, battery charging, etc.
- *b*) Generator, 6-volt d.c., coupled to an a.c. motor for 6-volt circuit testing
- *c*) Auto generators of different makes

Gravity Cells

Magnets — testing, 10,000-ohm

Meters
- *a*) Ammeter, standard, 60-amp., a.c.
- *b*) Ammeter, standard, 60 amp., d.c.
- *c*) Ammeter, student, 60-amp., a.c.
- *d*) Ammeter, student, 60-amp., d.c.
- *e*) Voltmeter, standard, 0–10-volt, d.c.
- *f*) Voltmeter, standard, 110–220-volt, d.c.-a.c.
- *g*) Voltmeter, standard, 125-volt, a.c.
- *h*) Voltmeter, standard, 125-volt, d.c.
- *j*) Voltmeter, student, 110-volt, d.c.
- *k*) Voltmeter, student, 110-volt, a.c.
- *l*) Wattmeter, standard, 110–220-volt, 30–60-amp., d.c.-a.c.
- *m*) Wattmeter, student, 110–220-volt, 30-amp., a.c.-d.c.
- *n*) Watt-hour meter, 125-volt, 5 amp., a.c., single-phase, various makes

Motors
- *a*) Auto starter, different makes
- *b*) Burnt-out, fractional h.p., 110-volt, 60 cycle, for repairing
- *c*) Compound, 1-h.p., 110-volt, d.c.
- *d*) Multiple-speed, 1-h.p., 3-phase, 220-volt
- *e*) Series, 1-h.p., 110-volt, d.c.
- *f*) Shunt, 1-h.p., 110-volt, d.c.
- *g*) Split-phase and repulsive, a.c., 110-volt, single-phase, assorted
- *h*) Split-phase induction motors, fractional h.p., 110-volt, 60-cycle, different makes
- *j*) 3-phase, 1 h.p., a.c., 220-volt, various makes
- *k*) 3-phase, 2 h.p., 220-volt, a.c., various makes
- *l*) Universal, fractional h.p., 110-volt, different makes
- *m*) Universal, variable-speed, ½ h.p.

Platform Scale — 100-lb. capacity

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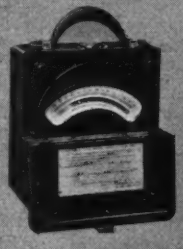
Following is a condensed listing of the WESTON instruments available . . . also are illustrated a few of the models most widely used in educational work. Complete information on any WESTON instrument is available and will gladly be sent on request. Write to . . . Weston Electrical Instrument Corporation, 595 Frelinghuysen Avenue, Newark, New Jersey.



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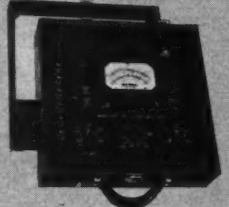
Model 430
Portable, Precision A. C. and D. C. Instruments

Universally used in schools and industry wherever rugged, portable instruments are required for general testing. Hand calibrated, mirror scales with knife-edged pointers.



Model 785
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Provides 27 ranges . . . all the ranges necessary for voltage, current and resistance measurements in signal, control and electronic circuits, or wherever else high sensitivity is a factor.

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PANEL MOUNTING INSTRUMENTS
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RELAYS
Sensitive and Power Uses – Current and Voltage Types

INSTRUMENT TRANSFORMERS
Portable and Switchboard – Potential and Current

AIRCRAFT INSTRUMENTS
Tachometers, Temperature Indicators, Radio Compass Indicators, Ammeters, Voltmeters, etc.

ELECTRIC TACHOMETERS
A.C. and D.C. Types – Remote Indicating

LABORATORY STANDARDS
Voltmeters, Ammeters, Wattmeters

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ELECTRICAL TYPE – Remote Indicating
BIMETALLIC DIAL TYPE – Laboratory, Industrial

INSTRUMENT ACCESSORIES AND PARTS
Shunts, Cables, Resistors, Switches, Binding Posts, Leads, Multipliers, Adapters, Radio Plugs, etc.

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Small, sturdy, inexpensive . . . for all-around A.C. and D.C. testing where moderate accuracy is sufficient. Available in Voltmeters, Ammeters, Milliammeters. A.C. models available in single, double and triple ranges.

Model 155
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Single or multi-range instruments, movable iron type, for general testing where high accuracy and long scale length are desired. Ammeters available with ranges up to 500 amperes, self-contained; Voltmeters up to 750 volts, self-contained. Sturdy, hardwood cases.

Model 633
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Current readings obtained simply by placing clamping jaws around conductor. Circuits never disturbed. 6 current ranges. High insulation for complete protection.

Model 772
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Sensitivity of 20,000 ohms per volt. Adequate voltage, current, resistance and output meter readings for servicing receivers, transmitters, P.A. systems, vacuum and cathode ray tube equipment, communications circuits, etc.

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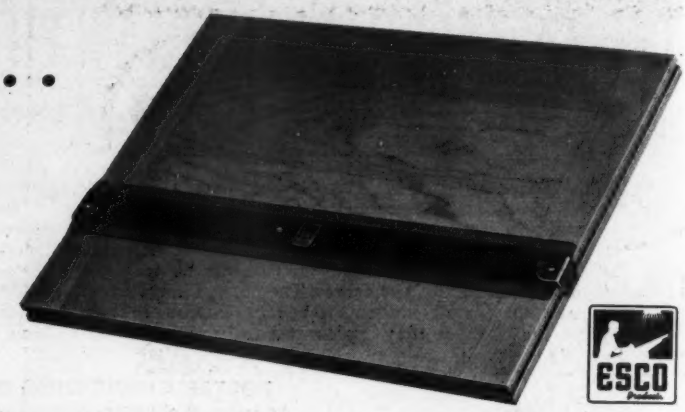
16"x21" 18"x24" 20"x26"



In the last decade drafting practice has changed tremendously . . . T-squares are rapidly becoming obsolete and are being replaced with straightedges operating on parallel ruling devices. THEREFORE — why teach your students to draw on old-fashioned equipment that they will not use after entering the professional field?

The new ESCO SCHOLASTIC DRAWING KIT operates exactly like a full size drafting table. The paralleling device, consisting of fibre pulleys and braided monel-metal cable, is built into grooves in the edges of a fine quality drawing board, thereby affording complete protection against damage. An accurate BAKELITE STRAIGHTEDGE is supplied either with or without transparent edges. The drawing board is reversible and straightedge can be used on either side. All materials are of the highest quality, yet the prices are low.

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CITY AND STATE_____

(Continued from page 68A)

in industry have given him an admirable insight into what a course on shop mathematics ought to contain and he has succeeded in embodying all of the desirable material in this one volume.

The book has been divided into 20 chapters which deal with the following: common fractions; decimal fractions; square root; percentage and its application; applied algebra; measuring instruments; applied geometry, mensuration, weights; logarithms; shop trigonometry; taper and taper turning; screw threads; pulley and gear speeds; thread cutting on a lathe; speeds and feeds; gears; indexing; cutting spirals; computations on work, power, and energy; belting; the slide rule; and tables.

Each chapter contains numerous illustrative examples and many practice problems. The mathematical problems also are correlated with shop practice, and questions bringing out this feature are found at the end of the chapter.

The section on the slide rule has been placed last, but the instructor may insert it in the course at any point that he may deem advantageous.

Gas and Oil Engines

By Peter S. Caldwell. Cloth, 125 pages, 5 by 7½, illustrated. Price, $1.50. Published by Chemical Publishing Co., New York, N. Y.

A book intended for the practical man and the student who want to get a thorough understanding of the fundamental principles of this type of heat engines.

The book is divided into 15 chapters which treat the subject in a fairly thorough manner under the following headings: gas engines; engine details; oil-engine parts; the igniter; governing; cooling and lubrication; the gas producer; installation; starting, running, and stopping the engine; starting, running, and stopping the gas producer; care of the engine; engine troubles and remedies; indicator cards; methods of testing and results of tests; and calculations used in tests.

Practical Pottery

By R. Horace Jenkins. Cloth, 192 pages, 6⅛ by 9¼, illustrated. Price, $2.75. Published by the Bruce Publishing Co., Milwaukee, Wis.

The author of this book has had upward of 20 years experience as teacher and craftsman in this field of pottery making. Out of the wealth of knowledge thus gained, his comprehensive little volume will prove exceedingly helpful to many shop instructors, students, and home craftsmen.

There are 22 chapters which deal with the historical background, clay and clay preparation; hand-built pieces; suggested pottery designs and decorations; plaster of Paris and mold making; casting; throwing; turning, trimming, and drying; throwing large pieces; tilemaking; pressing and making irregular shapes; clay work in the school; commercial production; biscuit firing; glazes and glaze composition; matt and fritted glazes; recipes for the potter; glazing and glost firing; problems and defects; equipping a pottery shop, general information; and the joys and sorrows of pottery making.

Learning Electricity Experimentally

By C. S. Siskind. Cloth, 160 pages, 7⅛ by 10⅛, illustrated. Published by Burkert-Walton Co., Evansville, Ind.

The author of this book has acquired a wide teaching experience over many years as instructor of beginners' classes, the teaching of apprentices and tradesmen, and the work with engineering students in a university.

He has thoroughly learned the value of letting the student acquire a knowledge of electricity by performing experiments with simple electrical apparatus.

This apparatus is fully listed and described in the book and the directions for each experiment are concisely and clearly stated, and well illustrated. Beginners will enjoy learning electricity taught in the author's way.

The book is divided into 11 chapters in which the work is treated under the following headings: Energy and electrical effects, magnetism and electromagnetism with direct current, electromagnetism with alternating current, magnetic effects produced with relatively high values of alternating current, magnetic effects produced with relatively low values of alternating current, electromagnetic induction by changing the value of magnetism linking with a coil of wire, the principle of electromagnet induction applied to the transformer, Lenz's law and inductance effects, magnetic flux control by inductive methods, the rotating magnetic field and the operation of small a.c. motors, and supplementary experiments.

Block Prints

By William S. Rice. Cloth, 70 pages, 7½ by 10¼, illustrated. Price, $2. Published by the Bruce Publishing Co., Milwaukee, Wis.

Written and illustrated by an artist with an artist's conception of the fine old art of block printing, this book, couched in simple language, tells the beginner what he needs in the way of tools and materials to cut and make block prints. Next he is led step by step through the design, cutting the block, and pulling the proof of his first block. Then he is introduced to the making of more difficult single and multicolored blocks, embodying lettering and the application of various techniques. Throughout the book are dispersed excellent examples of block printing, urging the student onward in his efforts to master this beautiful and not too difficult method of artistic cut making.

The book also contains a glossary and a bibliography.

Applied Textiles

By George B. Linton, Charlotte Steinmetz, and Louis Friedman. 220 mimeographed pages, 8½ by 11 with spiral binding. Price, $1.50. Published by the Bureau of Industrial Education, State Department of Education Building, Albany, N. Y.

This course of study in textiles was prepared

(Continued on page 78A)

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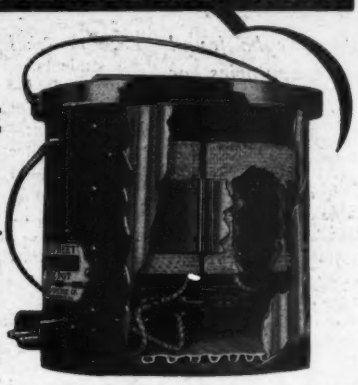

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This is one of aviation's most vital and complex subjects, presented in student terminology, stage by stage. Here are explained in explicit detail exactly the maintenance problems with which every mechanic is faced; to which every student mechanic must know the answer; which every training school must make certain its students understand. Much of the material offered has never appeared before in book form. Important topics concerned with materials and processes take up 135 pages; 20 pages list and describe standard airplane parts; the sections on hydraulics and electrical systems are of vital importance.

HUBERT G. LESLEY, Maintenance Engineer for Eastern Airlines, is the author of this book. His wide experience in successfully solving the maintenance problems of leading aircraft and accessories manufacturers, of scheduled airline operators and private pilots has enabled him to interpret in easy-to-understand language the sometimes technical and involved phases of aviation.

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Drafting Equipment and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

Adjustable-Curve Ruler
Beam Compass
Bench Brushes
Blackboard
- *a*) Permanent or portable
- *b*) Compass, 15 in., with locking device
- *c*) Drawing set: T square, straightedge, triangle, and protractor

Blueprint
- *a*) Frame or machine
- *b*) Washing trays or washer
- *c*) Paper tube, air-tight
- *d*) Drying rack or dryer

Bookcase
Cabinet
- *a*) For filing drawings
- *b*) For storing drawing boards
- *c*) For storing drawing instruments
- *d*) For storing models

Calipers — 6 in. and 8 in., inside and outside
Chair — teacher's
Desk — teacher's
Dividers — proportional
Drafting machine — and accessories
Draftsman's Steel Protractor
Drawing Boards — large
Drawing-Board Supports — to be set on or attached to woodworker's bench
Drawing Tables and Stools
- *a*) For Students
- *b*) For Teachers

Ink-Bottle Holder
Irregular Curves — Nos. 17, 21 and 24, wood, rubber, or transparent
Lettering Angles
Lettering Pens — assortment of 12
Level or Transit — builders' for architectural students
Leveling Rod — for use with the transit
Machinists' Combination Set — 12 in.
Marking Pins — for use with measuring tape, for architectural students
Micrometer — 1 in., for mechanical-drafting students
Oilstone — 3 in. case
Pantograph — 21 in.
Parallel Rules
Planimeters
Plumb Bob
Shears — for trimming blueprints and drawings
Speed Counter — for mechanical-drafting students
Steel Scales — 12 in.
Stop Watch — for mechanical-drafting students
Table
- *a*) For cutting and trimming drawings and blueprints
- *b*) For disassembling and reassembling machine parts and models

Tapeline
- *a*) 100 ft. steel, for architectural students
- *b*) 50 ft., steel or metallic

Tool Box — containing 1 machinists' hammer, one 6 in. adjustable wrench, one 6 in. screw driver, one 6 in. combination pliers
Triangles
- *a*) 30–60-deg. 14 in. transparent
- *b*) 45-deg. 10 in. transparent

Triangular Scales — civil engineers' type, 12 in.
T Square — adjustable or fixed head, for large drawing board or straightedge with parallel rule attachment for large drawing boards
Wall Charts — lettering, decimal equivalents, etc.
Yardstick

Drafting—Small Equipment

To be provided by, or for, each student

Drawing Board — size to be specified by instructor
Drawing Instruments — as specified by instructor
Erasing Shield
Irregular Curve — Nos. 8 and 13, transparent
Pencil Compass
Penholder — for lettering pens
Pens — assorted, for lettering
Protractor — not over 5 in.
Scale — 12 in. architects', triangular
Scale Guard
Slide Rule — 10 in., as specified by instructor
T Square — to fit drawing board
Triangles — 30–60-deg., 10 in. transparent, and 45-deg., 8 in. transparent

Drafting Supplies

Bichromate of Potash — crystals
Blueprint
- *a*) Paper, 36 in. wide
- *b*) Writing fluid

Paper
- *a*) Cross-section, 8½ in. x 11 in.
- *b*) Detail, 24 in. x 36 in.
- *c*) Drawing, 24 in. x 36 in.
- *d*) Isometric, 7 in. x 10 in.
- *e*) Tracing, 36 in.

Powder — for tracing cloth
Tracing cloth — 36 in.
Van Dyke
- *a*) Fixing salts
- *b*) Paper, 36 in.
- *c*) Writing fluid

Drafting—Additional Supplies

To be provided by, or for, each student

Erasers
- *a*) Cleaning
- *b*) Ink
- *c*) Pencil

Ink
- *a*) Black, waterproof
- *b*) Colored, if required

Pencils — *drawing*, HB, 2H, 3H, 4H, and 6H
Pencil Pointer Pad
Thumbtacks

Free TO HELP DRAFTING STUDENTS Start Right!

POST

BASIC EXERCISES

Drafting skill can be obtained in just one way — practice — consistent practice. It is of the utmost importance, therefore, that for rapid progress you learn the fundamentals of the correct handling of all drafting instruments and equipment. You must START RIGHT and practice

CHART ILLUSTRATES

- Handling the Dividers
- Bisecting a Line
- Line Alphabet
- Faulty Lines
- Starting a Circle
- Completing a Circle
- Guiding the Needle-point
- Drawing a Vertical Line
- Reading the Scale
- Position for Ruling Pen
- Position for Lettering
- Use of Irregular Curve

Space permits only a partial listing

All exercises and illustrations reprinted from— Prof. Thos. E. French's textbook "Engineering Drawing."

MECHANICAL DRAWING HELP FOR THE STUDENT

Mechanical Drawing instructors have found the Frederick Post Basic Exercise Chart to be a simple and effective way of illustrating fundamental points in drafting. This chart not only serves as a background to class instruction, but acts as a permanent reference for students. Chart shows the complete range of drafting instruments in a three-dimensional type of photography. Convenient wall size — 24" x 33¼", illustrated on two sides. Distributed FREE to mechanical drawing instructors as a gesture of good will from Post dealers.

STUDENT'S COMPLETE OUTFIT

Includes Ruling Pen, Compasses, Divider, Bow Divider, Bow Pen, Bow Pencil, Drawing Board, Tee Square, Scale, Protractor, Triangles, Curves, Drawing Paper, Ink, Artgum, Eraser, Pencils and Pointer. Price..... **$8.75** Complete

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NEWARK E. G. Ruehle
NEW ORLEANS Southern Blue Print Co.
KNOXVILLE Sehorn & Kennedy
OKLAHOMA CITY The A. & E. Equipment, Inc.
OMAHA Standard Blue Print Co.
PHILADELPHIA Philadelphia Blue Print Co.
PITTSBURGH American Blue Printing Co.
ST. LOUIS Service Blue Print & Photo Copy Co.
TOLEDO Toledo Blue Print & Paper Co.
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Kick wheels, electric portable and floor models available in four sizes, $39.00 up.

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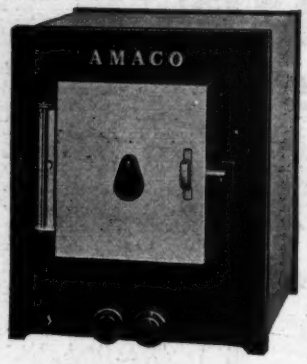

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(Continued from page 74A)

for the use of vocational teachers in secondary schools which train students for (1) the various phases of the textile industry itself, (2) the retail and wholesale buying and selling of clothing fabrics, and (3) homemaking and interior decorations.

The material is presented in four groups in detailed lesson-plan units. The lessons outlined in Group 1 include names and definitions of parts of cloth, classes of textile fibers and their identification, microscopic study of the major fibers, forms in which textiles are dyed, methods of making cloth, and basic weave constructions.

Group 2 contains a comprehensive outline for cotton, linen, wool and hair fibers, and shoddy and other wastes. The history, grades, characteristics, manufacture, and working properties are covered in detail. Standard fabrics constitute much of the objective work which embraces the identification of the various materials and how they may be manipulated for the best results.

In Group 3 similar studies are made of silk, rayon acetate, tussah silk, and other minor fibers of these types.

Group 4 gives attention to the physical and chemical testing of textiles, spot and stain removal and the care of textiles, dry cleaning, slippage, etc.

The course is laid out so that it may be applied to any school teaching textiles in a general or detailed way. Integration with allied vocational fields — millinery, dressmaking, garment cutting and machine operating, household materials — is a feature of the work.

Distinctive Clothes

By Frances H. Consalus, Anna G. Tighe, William H. Dooley, and Mayer Rohr. 502 pages, price, $2.40. Published by the Ronald Press, New York City.

The problems of clothes, their style, suitability, construction, and cost are of vital importance to all women, but particularly to the girl of high school age. *Distinctive Clothes* is a publication which is a guide to the solution of these problems.

This text was prepared for home-economics (clothing) students and is suitable for high school as well as trade school classes in dressmaking. The content is arranged in a logical sequence for instruction in the sewing processes. The generally accepted techniques of sewing are thoroughly analyzed and amply illustrated with sketches which are an aid to teaching demonstrations.

It is written in the language of experienced stylists and explains effectively line, design, and color as related to the individual textiles and their characteristics, standards for shopping and selection of ready-to-wear garments.

Helpful bibliographies and questions accompany each chapter.

How to Teach Beauty Culture

By E. M. Stanchak. Paper, 115 pages, 8⅜ by 10¾. Price, $2. Published by the author, 366 S. River St., Wilkes-Barre, Pa.

Home-economic teachers will, no doubt, be pleased with these mimeographed lessons on the subject of beauty culture.

The material has been analyzed into those items which the operator must be able to do and what she must know. Besides this analysis there are a number of excellent tests.

The subject matter has been divided into 14 units, which appear under the following headings: sterilization, manicuring, shampooing, finger waving, marcelling, scalp treatment, facial massage, eyebrow arching, hair tinting, hair cutting, spiral permanent waving, croquignole permanet waving, make-up and dressing transformation.

Where necessary, illustrations are used throughout the work.

Manual of Safety Instruction for Vocational and Industrial Arts

Compiled by Orange County Industrial Arts Teachers' Association. Paper, 46 pages, 5½ by 7¼. Published by The Fine Arts Press, Santa Ana Senior High School, Santa Ana, Calif.

Understanding American Business

By Cool and Neill. Cloth, 448 pages, 5¾ by 8½, illustrated. Price, $1.92. Published by Macmillan Co., New York City.

Movie Workers

By Keliher, Hess, Lebron, and Modley. Cloth, 56 pages, 7⅜ by 8¾, illustrated. Published by Harper and Brothers, New York City.

Financing Economic Security in the United States

By William Withers. Cloth, 210 pages, 5⅝ by 8⅝. Price, $2.75. Published by Columbia University Press, Morningside Heights, N. Y.

Effective Retail Selling

By Bernard F. Baker. Cloth, 280 pages, 5⅝ by 8¾, illustrated. Published by American Technical Society, Chicago, Ill.

How You Can Get a Better Job

By Willard K. Lasher and Edward A. Richards. Cloth, 175 pages, 5⅝ by 8½, illustrated. Price, $1.50. Published by the American Technical Society, Chicago, Ill.

Retail Selling Simplified

By Edith Fletcher Hayter. Cloth, 129 pages, 5 by 7½. Price, $1.25. Published by Harpers and Brothers, New York City.

Money in Exports

By Walter Buchler. Cloth, 221 pages, 5 by 7½. Price, $3. Published by Useful Publications, 524 Mansion House Chambers, London, E.C. 4, England.

The Road to Anywhere

By Frances Maule. Cloth, 196 pages, 5¼ by 7¾. Price, $1.50. Published by Funk and Wagnalls Co., New York City.

Household Employees Handbook

By Marion Hurst. Paper, 152 pages, 8½ by 11, illustrated. Published by The Dewing Publishing Co., Oklahoma City, Okla.

Bell and Howell Filmosound Library

Paper, 108 pages, illustrated. Issued by Bell and Howell Co., Chicago, Ill. (Catalog of Educational Motion Pictures.)

(Continued on page 83A)

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(Continued from page 78A)

A Course of Study in Industrial Arts
Prepared under the Direction of the Division of Youth Personnel of the National Youth Administration of Wisconsin, by Joseph F. Bertram and Ray L. Berger, John Faville, Jr., acting State Youth Administrator. Paper, 42 pages, 8 by 10½, illustrated.

Workbook to Practical Mathematics
By N. J. Lennes. Paper, 160 pages, 8⅛ by 11. Price, 60 cents. Published by the Macmillan Co., New York City.

A Composite Analysis of the Printing Trades
(A Research Project of the National Graphic Arts Association.) Cloth, 160 pages, 6 by 9. Issued by the Department of Printing, Masonic Home and School, Fort Worth, Tex.

Medical Occupations for Girls—Women in White
By Lee M. Klinefelter. Cloth, 320 pages, 5 by 7⅜, illustrated. Price, $2. Published by E. P. Dutton and Co., New York City.

Fashion for a Living
By Gertrude Warburton and Jane Maxwell. Cloth, 331 pages, 6⅛ by 9¼, illustrated. Price, $3. Published by McGraw-Hill Book Co., New York City.

American Social Problems
By Howard Patterson, A. W. Selwyn Little, and Henry Reed Burch. Cloth, 568 pages, 5¾ by 8½, illustrated. Price, $1.96. Published by the Macmillan Co., New York City.

The Mail Comes Through
By Charles Gilbert Hall, Cloth, 135 pages, 6¼ by 9⅜, illustrated. Price, $1.32. Published by the Macmillan Co., New York City.

Official Forms in Use (A Bibliography)

Institutions of Higher Learning in Relation to a State Program of Teacher Education

Quantitative Aspects of Experiencing in the Elementary School

Creative Hands and Purposeful Activities in the Elementary School
By Lester Ade. Pamphlets put out by the Commonwealth of Pennsylvania, Department of Public Instruction, Harrisburg, Pa.

It's Nice to Know People Like You
By Harry Walker Hepner. Cloth, 172 pages, 5¼ by 8. Price, $1.50. Published by D. Appleton-Century Co., New York City.

High School Journalism
By Spears and Lawshe. Cloth, 464 pages, 6⅝ by 9⅝, illustrated. Price, $2. Published by the Macmillan Co., New York City.

The Book of Diamonds
By J. Willard Hershey. Cloth, 142 pages, 6¼ by 9¾. Price, $2. Published by the Chemical Publishing Co., 148 Lafayette St., New York City.

Agriculture and Farm Life
By Phillips, Cockefair, and Graham. Cloth, 496 pages, 5¾ by 8½, illustrated. Price, $1.48. Published by the Macmillan Co., New York City.

ANSWERS TO QUESTIONS

FINISHING A RIFT FIR FLOOR

1075. Q.: I would appreciate your opinion and advice on a practical and durable finish for a rift fir floor in a cellar room finished with knotty pine. The room will receive much use, and most of it will be dancing, yet the owner does not want to have too much care attached to keeping the floor in good condition.

What is your opinion of finishing such a floor with shellac and wax?

A.: The practical type of finish to use on this floor is the new wood preservative floor finish as made by either DuPont or Sherwin-Williams Co. Either product will give a splendid finish. Probably, it will be found, that the DuPont finish may be best suited to the needs of fir flooring. This finish is particularly long wearing, and easily renewed should the occasion rise at some later date. All that is necessary is to follow the manufacturers directions explicitly, especially in regard to the time limits for material applications and drying. By all means give this very soft floor a second coat as noted.—*Ralph G. Waring.*

CASEIN VS. OIL PAINTS

1074. Q.: What about the advisability of using casein paint for the walls and ceilings of classrooms. How do oil paints and casein paints compare as to costs, quality, looks, fading, etc.—*J. E. C.*

A.: After considering the matter from every possible angle, the following data is pertinent:

A. Lead and oil, or similar product for walls:
Cost per gallon, $2.
Bulk, ready to brush, 1 gal.
Coverage of above 500–600 sq. ft., one coat only.
Odor, pronounced to quite strong.
Resistance to moisture, high.

B. Casein type coatings:
Cost per gallon, $1.85.
Bulk, ready to brush, 1½ gal.
This gallon and a half has same coverage as the lead.
Odor, faint to none.

Resistance to moisture, little to none, because this material decays soon especially in damp basements.

From my interviews with a number of our better master painters, I gathered that they were all of the opinion casein paints have little if any advantage over modern oil paints. They seriously questioned the desirability of using casein over old oil-base types and the possibility of returning to the latter types at a later date.

Since the use of this type is comparatively new, there is no way of knowing what the adhesion on old work is. No one knows whether or not a coat of casein paint over an oil base will crack,

(Continued on Page 84A)

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SECOND SESSION—AUGUST 1 to AUGUST 30

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The student may plan a program which will lead through successive summers to the bachelor's or master's degree. Approved programs carrying the recommendation of Oregon State College are accepted by all state departments of education for either a *Special* or a *General Secondary Credential*. Special leaflet available upon request.

***Address:* Department of Industrial Education, Oregon State College, Corvallis, Oregon**

Authorized by State Board of Higher Education

(Continued from page 83A)

or whether it will peel, nor is it known what will happen if oil paint is used over casein.

All are of the opinion, however, that if casein types are used on new work at all, they should be used as a series throughout the life of the structure. The same is equally true of the standard lead and oil, or flat-wall-paint types of today. Under no circumstances can a switch be made from one to the other and later back again on the same surface.

Finally, labor charges appear at this time to be equal, square for square, of both materials; either brush coated or sprayed.

The appearance on a comparative basis is very slightly in favor of the standard wall paint. Fading in each case is nonexistent, since both can be shaded or tinted with identical permanent type pigments to produce identical colors.

My personal opinion, based on 25 years of laboratory and trade specification work is still definitely in favor of the standard oil-base types. — *Ralph G. Waring.*

FINISHING HAMMERED IRON

Q.: Please describe how I may obtain a dead black finish on hammered iron.

A.: A dull black finish on wrought iron can be secured by covering the metal with a coat of linseed oil, and while still wet, running it back and forth through the flame of a forge with the blast on. Heat until all smudge from the burning oil is eliminated but avoid any tendency to heat to redness. Cool, wipe off with a cloth, and use.

In the absence of a forge, the only method possible is to clean the iron with a scrubbing brush, denatured alcohol, and rags to remove all traces of grease and handling. Use gloves so as not to touch the metal with the bare hands. Then coat the work with a brush or spray coat of flat, black enamel sold for this purpose by practically all paint stores. If the enamel is not available, then get flat varnish and mix in a very small amount of carbon black or gas black ground in oil. Paddle well and then apply as directed. — *Ralph Waring.*

Temper Colors

Q.: Can you give me a list of the tempering temperature scale and the temper colors or tarnish tints obtained when heating steel in the process of tempering?

A.: 590° Fahr.....Pale Blue
545° Fahr.....Violet
525° Fahr.....Purple
490° Fahr.....Yellowish Brown
465° Fahr.....Dark Straw
425° Fahr.....Light Straw
380° Fahr.....Faint Yellow

Tempering in Sand

Q.: How is tempering in sand done?

A.: Sand is put into a refractory container, placed on an open forge fire or over a gas burner. The pieces to be tempered are polished and placed on or partly under the sand, depending on the job. Watch closely, in a short time faint yellow will appear; then heat to the required temperature indicated by the color or tarnish tint. Then quench in water or oil.

NEWS NOTES

Cincinnati printers and lithographers will take an active part in the operation of Printing High School through the medium of the new "Cincinnati Graphic Arts Education Council." R. Randolph Karch, principal of the school, said in releasing this information, "Contact with industry groups is of vital importance to the success and adequate function of any trade school."

Three Cincinnati trade organizations are represented by two members each: Franklin Typothetae of Cincinnati, Inc.; Oliver W. Perin, The Gibson & Perin Co., Inc., and Emil Hirschfeld, The Hirschfeld Printing Co., The Printers League: Major Herbert Nieman, President, Arrow Press; George Meyers, Western Printing Co., The Cincinnati Club of Printing House Craftsmen: Lee Augustine, vice-president Printing Machinery Co., John M. Callahan, secretary, United States Printing and Lithograph Co.: Alternate, Carl Heaton, pressroom foreman, Richardson-Taylor-Globe.

The council, as tentatively set up, includes the following seven purposes: (1) To establish and maintain proper understanding of graphic arts educational activities in the city of Cincinnati and vicinity; (2) To facilitate the necessary cooperation between printing schools and trade groups; (3) To spread information concerning the objectives of vocational education and industrial-arts education in the graphic arts; (4) To aid educational activities through the advice and experience of the various trade groups; (5) To aid the various trades in the best selection of proper material for apprentices in the graphic-arts industries of Cincinnati and vicinity; (6) To further the educational facilities of those workers already employed in graphic-arts industries: (7) To establish a library of graphic-arts material in which employers, journeymen, apprentices, and students may study and refresh themselves on all graphic-arts procedures and methods.

Printing High School is now set up to function in three major activities: (1) Training of apprentices for the trade, and the further education of apprentices already working in the trade; (2) Further training of journeymen in special process, and in the operation of the various machines used in the industry; and (3) for the provision of a clearinghouse of information so that all employers can solve individual technical and business problems through the use of an index to articles appearing in 52 graphic-arts journals published in America.

♦ The Tacoma, Washington, board of education

(Continued on page 87A)

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Slugs—1¼"-1"-⅞"-¾"—dia.
(in any thickness)
Pewter Solder—70/30—12 ga. round
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(Continued from page 84A)

decided in August, 1940, to develop a department of vocational education, with trade and occupational training available to apprentices, adult workers, and high school students.

Millions of dollars of defense contracts have been let by the United States Government for the construction of army buildings, aircraft and bases, and naval and merchants ships in the Puget Sound area.

With limited funds for buildings and equipment, plans are being made to build the school shops in installments to care for the National Defense training, but with a view to ultimate peace-time training needs.

♦ The Bellingham, Washington, school district has been selected as one of the training centers in the state under the National Defense Training Program. Already approximately 50 young men have been trained for work in the Boeing aircraft factory in Seattle and are employed there. About 100 others are now training for the same work. Additional classes in welding for cannery machinists are now being organized.

James Bowen, instructor in Smith-Hughes auto mechanics is the vocational supervisor in charge of this work.

♦ The high school at Hartford, Wis., is adding considerable equipment at present in order that some training may be given in metalwork in connection with the manual-arts department.

♦ "New Problems Facing the Graphic Arts Industries" is the general theme for the 13th annual series of lectures on the Graphic Arts to be given before the students and faculty of the Department of Printing, Carnegie Institute of Technology during the college year 1940–41. The course of lectures was arranged by the National Graphic Arts Education Association in cooperation with Prof. Glen U. Cleeton, the head of the Carnegie Department of Printing.

The topics and speakers are: "Meeting New Problems in Sales and Production," Walter B. Patterson, Mergenthaler Linotype Co., Brooklyn, N. Y.; "The Modern Trade Association," Donald Rein, executive vice-president, United Typothetae of America, Washington, D. C.; "Research in Multi-Color Production for Letterpress, Off-set and Gravure," Dr. Adrian Leroy, director of research, American Type Founders, Elizabeth, N. J.; "Industrial Relations," Gerald Walsh, executive secretary, National Printers Association, Washington, D. C.; "Meeting New Demands with New Processes," Walter S. Marx, Jr., Printing Arts Research Laboratory, Hall Printing Co., Chicago, Ill.; "New Developments in Ink Research," Dr. William F. Talbot, Research Department, General Printing Ink Corp., New York, N. Y.

During the month of April, 1941, a special feature in connection with the lecture series will be the celebration of the twenty-eighth anniversary of the Carnegie founding of the Department of Printing, with Harry L. Gage, vice-president, Mergenthaler Linotype Company and first head of the Department of Printing at Carnegie, as the general chairman. The program for the occasion provides for the annual meeting of the alumni of the Printing Department and the spring meeting of the Advisory Council on Graphic Arts education.

♦ Clayton High School of Clayton, Mo., is the first high school in Missouri to introduce automobile driving training as a part of its educational program. The general supervision of the training will be under Sam F. Hall, also instructor of industrial arts, and Ralph Harris will have immediate charge of instruction.

A special car with dual controls has been furnished by the Missouri Automobile Club through cooperation of the American Automobile Association. The new course will cover six periods of six weeks each and will accommodate about 125 students this year. Based on the modern techniques of airplane pilot training, the course will require each student to spend 32 hours in the car, 8 hours of which will be behind the wheel. The instructor will have four students in the car at a time. Thirty hours will be spent in classroom work. Upon completion of the course, a student can take a road test which will enable him to obtain a driver's license, provided he has his parents' consent.

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Directory of Manufacturers' Products

This directory is published as a convenient guide to sources of supply covering the products of manufacturers carrying specification data in the ANNUAL NUMBER. For alphabetical index of manufacturers' specifications see page 79A. To obtain products not included in this directory, quotations or additional information to help you make up your specifications, lists of equipment, etc., address Industrial-Arts Service Division.

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Behr-Manning Corp.
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U. S. Blue Co.

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Miller-Simons, Inc.

AIR CONTROL UNITS
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Millers Falls Co.
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Delta Mfg. Co.
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Wallace & Co., J. D.

BAR IRON
American Handicrafts Co.

BATTERY CHARGERS
General Electric Co
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General Stove Hardware Co.
Johnson Gas Appliance Co.
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American Technical Society
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National Lead Co.
White Metal Rolling & Stamping Corp

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Post Company, Frederick
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BUFFERS, BENCH, PEDESTAL
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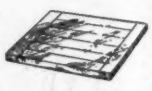

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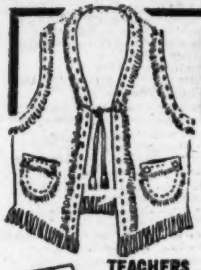

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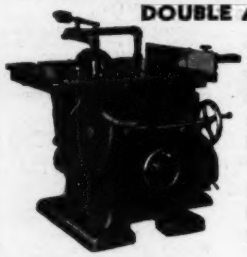

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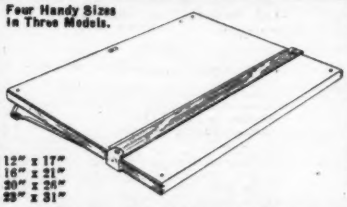

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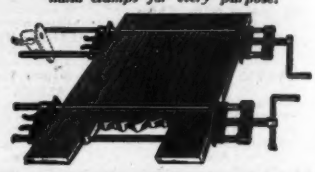

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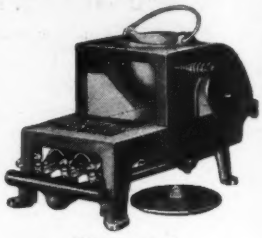

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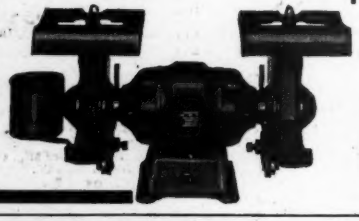

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